SCIENTIFIC AMERICAN

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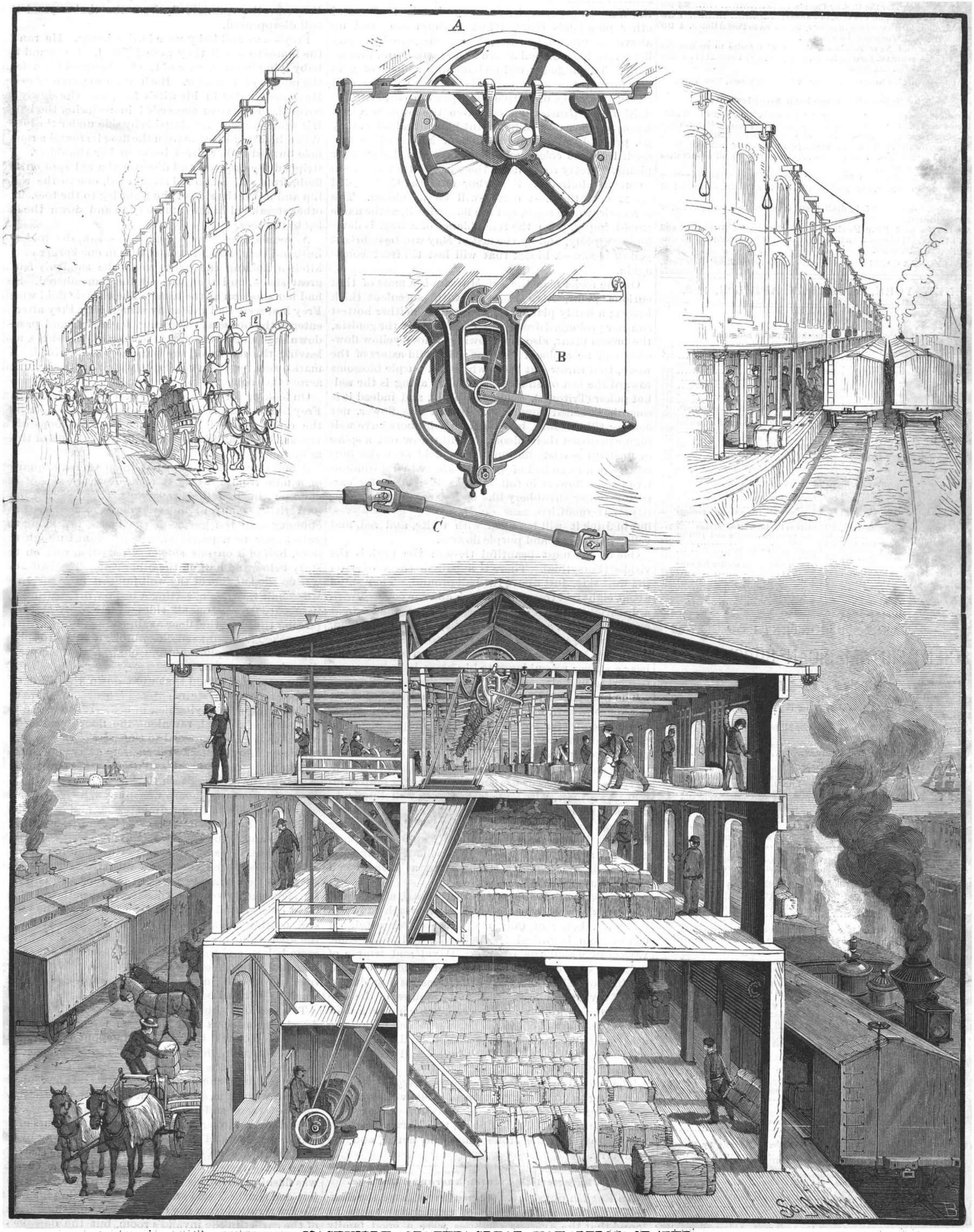

THE VOLNEY W. MASON HOISTING MACHINERY AT THE GREAT HAY DEPOT OF THE NEW YORK CENTRAL RAILWAY, NEW YORK CITY.—[See page 244.]

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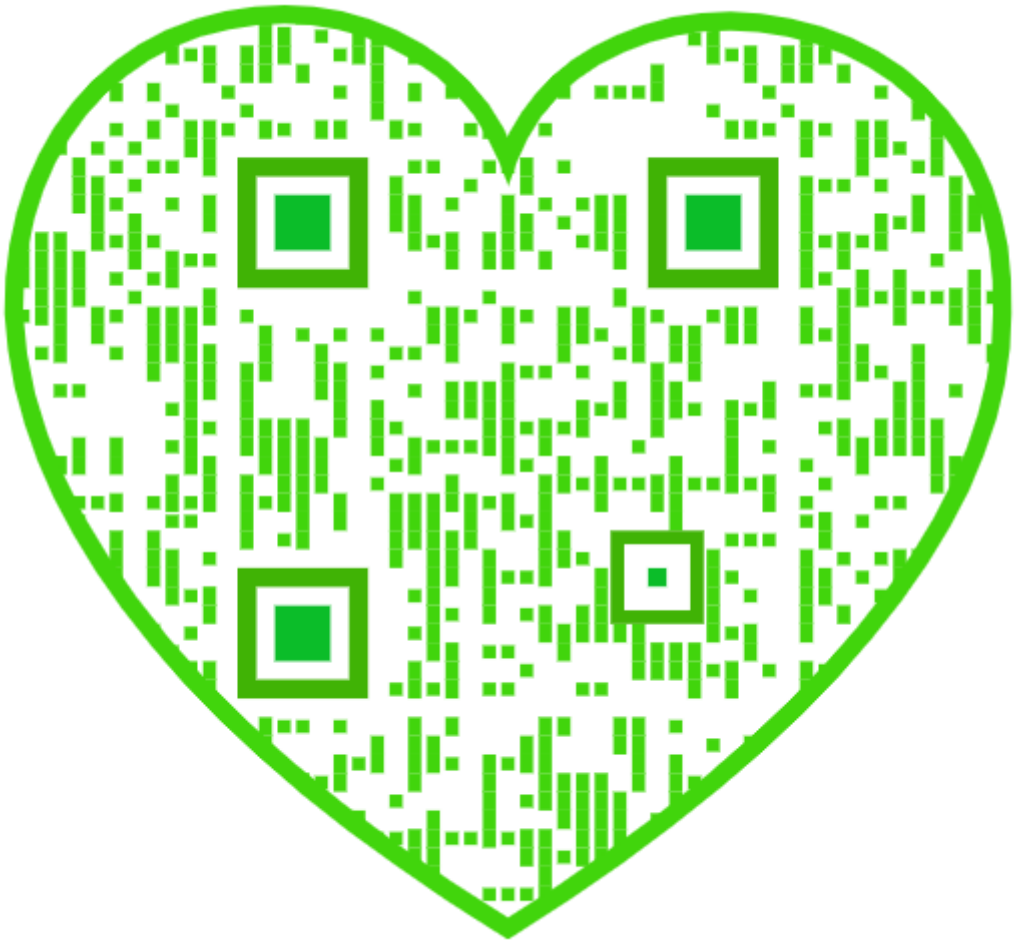

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CENTRAL PARK VEGETATION.

Rain and sun a-plenty have hastened along the somewhat tardy vegetation of the Central Park. The lawns and hillsides seem daily to become greener and more luxuriant, and the flock of Southdowns over in the Western pasture nip less eagerly toward the close of day; the lambs having more time for sport among the rocky hillocks and knolls at the southern limit of their domain. But there is a deal of moisture in the ground, and "Shep," the collie, who has charge of the flock, must needs keep moving around for fear of rheumatism, even keeping his long, bushy tail well clear of it, though later on, when the grasses are tall and dry, and the flock quieter, he will doze away the summer afternoons under the wide-spreading elm near the Western promenade. Many thousands of tulips and other perennials planted last autumn are well up above ground, and others, less robust, are lifting up little trapdoors of soil above them farther and farther daily. The daffodils will be blooming a maze of gold in a fortnight or so, and the lilac bushes will be covered with bunches of purple perhaps even earlier. The daisies and pansies, set out from the hotbeds a few weeks ago, are now in luxuriant bloom, and when they go, probably about the middle of May, will be succeeded by the coleus and geranium and the summer plants. Pretty soon, now, the wistaria that has been so much admired at the arbor near the Casino—72d street near the East drive—will be in bloom. The coreopsis, whose seeds, not the flower itself, as the name would imply, have the resemblance of a bug, is developing rapidly, and by the last of May will be in bright yellow bloom—a bloom that will last till frost comes again.

On the rocks near the Art Museum is a mass of that curious plant, Live Forever, with succulent thick leaves; a hardy plant it is, that minds neither hottest sun nor prolonged drought. Then there is the genista, the broom plant, also low-growing, whose yellow flowerets will be a-bloom in June; the wild asters of the wood, that throw out their white and purple blossoms toward the last of summer. Further along is the red-hot poker (Tritonia), being like a lily, and indeed it is sometimes called torch lily. It is a late flower, not coming till autumn, but when its neighbors have well nigh exhausted their bloom, it will throw out a spike of brilliant scarlet flowers. In a field near the hothouses is a large bed of perriwinkle, with its diminutive purple flowers in full bloom. It is used for carpeting under shrubbery like ivy. Near by is a quantity of German iris, now only a mass of green leaves, but in June it will be filled with white, and red, and yellow, and blue, and purple flowers.

One of the most beautiful trees in the park is the viridis] (Forsythia). There is a pair of them over on the west side, just above the ball ground. They stand about eight feet from the ground, and are covered with a luxuriant mass of yellow spires, that make great curves outward, and droop till they touch the ground, thus forming a bower. It is easy to understand why they have been given the name "golden bell," for they bear a strong resemblance to big brass bells hung suspended in mid-air.

The honey locusts along the Western drive are thriving apace toward blooming, being one of the hardiest trees known for rocky soils. Its proper name is *Gleditschia triacanthos*, its foliage being made up of many finely pinnate dark green leaves, having small flowers and long irregular pods filled with highly polished seeds. These seeds are surrounded with a pulp of intense sweetness, with a delicate flavor well known to most boyish palates; but these pods are not so easily gathered, for, as if nature was opposed to their being indulged in too freely, there are formidable spines growing along the trunk, which will discourage the most ambitious climbers, being stout as hickory and sharp as a serpent's tooth.

The cedar of Lebanon (*Pinus cedrus*), also on the Western drive, is in bud, and is alone worth a visit to the park, being at once majestic and beautiful. It comes from historical Mt. Lebanon, and is the same variety of which the palace of David and temple of Solomon were built. Once, as we are told, it covered the hills of Lebanon, some of the trees having diameters of seven and eight feet, and, because of the fragrance and durability of their wood, being in demand for palaces and sacred offices; a demand which became so great that forest after forest disappeared, till finally, in the time of Justinian, not enough could be found to build a single house.

The spreading junipers (*Juniperus virginiana*) are beginning to burst their brown and yellow aments, and are giving other evidences of activity. So are the Scotch pines, the Austrian pines, the Norway spruces, the white pines, the stone pines, the nettle, and the mulberry.

The Characteristics which Surround Old Age.

An English physician, who has investigated the characteristics and surroundings of centenarians, says he found that the average qualities were a good family history, a well made frame, of average stature, spare rather than stout, robust, with good health, appetite, and digestion, capable of exertion, good sleepers, of placid temperament and good intelligence, with little need for and little consumption of alcohol and animal food.

An April Thunder Storm.

A dispatch to the Associated Press from Tionesta, Pa., says: During the frightful thunder storm that passed over the oil regions on Friday afternoon, April 6, Simon Frey was in his barn, looking out of the door. A blinding flash of lightning was followed almost immediately by a terrific thunder clap, and Frey saw a ball of fire run along a wire clothes line from a post in the yard to a corner of the house, to which one end of the line was fastened. When the ball struck the house, Frey saw the splinters fly from the timbers, and the ball disappeared.

Frey's wife and baby were in the house. He ran to the house to see if they were injured. He found the baby lying in one corner of the kitchen and his wife in the middle of the floor. Both were apparently dead. He dashed water in his wife's face, and she slowly recovered. Frey then succeeded in restoring the baby. His wife's shoes were lying side by side under the table. When he lifted his wife from the floor he found a round hole burned in her dress between her shoulders. He stripped the dress off and discovered a red spot on the flesh, from which two red streaks led, one to the right hip and down the side of the right leg to the toes. The other streak led in the same way to and down the left leg to the toes.

As soon as Mrs. Frey was able to speak, she told her husband that she had been sitting in one corner of the kitchen, holding the baby, when she suddenly felt a great shock, and that was all she remembered. She had her shoes on at the time. The electric fluid which Frey had seen had evidently struck Mrs. Frey after it entered the house at the corner, separated, and passed down each side of the body, tearing off her shoes, and leaving the marks of the passage as described. No marks were found on the baby, which had been hurled across the room.

On looking for further traces of the electric current, Frey found that it had passed through the floor into the cellar, where it had burned the iron hoops off a vinegar barrel and made a hole in the bottoms of three milk pans.

A bolt struck the house of William Oadel, a quarter of a mile from Frey's. It came down the side of the chimney, hurling the bricks in every direction, and pulverizing many to fine powder. It followed the chimney into the garret of the house, ran along the garret floor to a partition, when it went through the floor, half of it on one side of a partition wall on the story below and half on the other side. The half that was on the left side of the wall jumped into the room when half way down, setting a bed on fire, tearing the baseboards away on all sides of the room, and then passing through the floor again to the kitchen, where it knocked a servant senseless, broke a table to splinters, set fire to a splint bottom chair, and then passed down into the cellar.

The part of the fluid that went down the right side of the partition up stairs entered a bedroom where one of Oadel's sons was lying sick in bed. It splintered the footboard of the bed, ran along the floor, burning the carpet as it went, returned to the partition, and, passing down into it, knocked it entirely away between the dining room and kitchen, and disappeared through the floor into the cellar. With the exception of the servant girl, no one in the house was injured, although there were seven persons in the dining room and two besides the girl in the kitchen. Mrs. Oadel ran up stairs to her sick son, and found the carpet on fire.

The invalid was uninjured. The fire had barely been extinguished when the house was struck the second time, the bolt passing through the roof and entering the sick man's room. It knocked the headboard of the bed to pieces, and ran along the four sides of the room, and, uniting again on one side, where it passed through the floor, splintered the casing from a window in the room below, and tore the clapboards off the side of the house for several feet, spending its force against a cherry tree, to which it jumped from the house, splitting its trunk as if it had been done with an ax.

The servant whom the first stroke of lightning rendered unconscious had not been restored when the house was struck the second time, but she came to without anything having been done to restore her, immediately after the house was struck the second time. Every person in the house, except the servant and the invalid, was made deathly sick by the second stroke, some of them suffering with distressing nausea, attended by a strong sulphurous taste for hours afterward. The invalid was not affected in any way by the fluid, although he declared that a flame the size of a lamp flame rested on his forehead while the current was flashing about his bed, and that from it a thousand jets and sparks issued and seemed to envelop his head. No fire resulted from the lightning, except the burning of the carpet in the invalid's room, but the damage to the property will require the almost entire rebuilding of the house.

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Military Notes.

The recent practice of the French Mediterranean squadron under Vice-Admiral Amet, in the roads of Toulon, aptly illustrated how advantageous to the French are the present changes in the mode of conducting naval operations. When good seamanship was the primal consideration, the Anglo-Saxon had a manifest superiority; he being a born sailor and possessing that phlegmatic coolness and endurance which counts for so much in the handling of sailing craft. But now that the sailor is succeeded by the engineer and machinist, when the rigors of sea life have been reduced by science to a minimum, and quickness and ingenuity are of the first importance, the Latins are showing well to the front; for, if we may rely upon the accounts of the recent practice of this French squadron as given in *L'Avenir Militaire*, there were fewer breakdowns and mishaps and quicker response to orders than in any similar practice of modern ships, whatever their nationality. The squadron was made up of six ships of the line, Colbert, Devastation, Amiral Duperre, Courbet, Redoutable, and Friedland, the floating batteries, Indomptable and Terrible; the Milan, a first-class steel cruiser; the Condor, a cruising torpedo boat; the Balny and Doudart de Lagree, sea going torpedo ships; and six torpedo boats of the harbor defense type. The squadron was manned by 6,000 men and carried a battery of 130 big B. L. guns, besides a formidable display of machine guns. Though there was a stiff breeze of wind and a heavy sea running, the squadron formed line, divided into two columns, and formed crescent and wedge without running afoul the one ship of the other, or falling astern from mishap or lack of coal. To those who have studied such displays this will scarcely fail to be looked upon as remarkable.

In the new regulations for the conduct of field operations of the German army (*Felddienst-Ordnung*) the careful observation and mathematical precision of the German mind is clearly discernible. The composition of the advance guard and the rear guard of a marching army has been variously formulated by military writers, with a general tendency to strengthen the van and neglect the rear. In the new German orders this is reversed; the rear guard being made by far the strongest, because it cannot look for any support, while the advanced guard if in need of re-enforcements has only to fall back or wait for the main body to come up. It is, however, where directions are given as to keeping a portion of the road clear on the line of march and the treatment of troops while *en route* that these orders are most original and interesting, and, with no intention of giving an opinion as to their efficacy, their reasonableness is obvious. Students of military history will remember how often armies with everything favoring their success have been detained or even demoralized by long marching without food. It is the footsore infantry and the lame horses of the cavalry that give the trouble, for, as the strength of a chain is not greater than that of its weakest link, so an army cannot move faster than its slowest sections. Napier, in his admirable history of the Peninsular war, describes the disastrous effects of that penny wise, pound foolish policy of saving an hour that should be given to rest, and then losing six because of premature fatigue of the soldier, and there have been many modern instances of this.

Major Wachs, of the German army, in an extended examination of the place held by Britain among the nations, and especially as to her military strength, declares her to be weak in her insular defenses and as having by no means adequate power to defend her possessions. These latter, he thinks, are likely to tend to her utter discomfiture in the future, for that once her strength is put forth to defend them, she will leave her immediate coast assailable, and in proof of the danger of this he quotes Napoleon's remark: "Six days' command of the channel, and on the fifth I shall be in London." He does not believe that the guns made at Woolwich are to be depended upon, and cites the accidents aboard the Collingwood and Thunderer as evidence in support of this belief, and a recent order of the British Admiralty to the captains of the fleet, forbidding the firing of big guns save under special instructions. From a translation of this paper printed in the *Royal United Service Journal*, we quote: "Major Wachs reproaches us [the English] with our inaction and irresolution in allowing the favorable opportunity of the great war of secession [American civil war] for putting down our dangerous rival for the dominion of the North Atlantic to pass away. When the war which he foresees with America once commences, he prophesies the loss of Canada, which he supposes not to have forgotten its French origin."

A French military writer, M. De Fletres, in an essay on the education of the French infantry, makes some very serious charges against the French soldier. The latter, he says in effect, has serious moral as well as physical defects; grossly abuses his officers when out of hearing, is careless and slovenly, has no heart for military service, and, when opportunity comes, conceals all trace of its insignia.

How to Make Crayon Portraits.

BY E. W. CURRIER.

Supply yourself with some charcoal pencils, a stretcher covered with Whatman's crayon paper, and chamois skin palette, a chamois stump, tortillons, a porte crayon, some sticks of black Conte crayon No. 3, some finely pulverized pumice stone, an easel, a mahl stick. Having now purchased your materials, you proceed to sketch the head you are going to make with a lead pencil on thin, smooth paper. Having made the sketch, rub charcoal entirely over the back. Now lay this sketch over the stretcher and trace the outlines with a hard lead pencil on the sketch, remove the sketch, and you will find the drawing nicely transferred on the stretcher.

Now grind up some crayon very fine with emery paper, and saturate the chamois palette. Dip your chamois stump into the crayon sauce and work in the principal shadows, preserving their form and depth. After the crayon is thinner on the stump, rub in the half tints. After this is done take a tortillon and place in your porte crayon holder and work in the shadows all over the face, evening up the shadows and smoothing up the entire face. Mix some of the pulverized pumice stone with the powdered crayon and rub this preparation over the background and drapery with the end of your finger, using a circular motion. By practicing on drapery awhile you will acquire the knack of doing this evenly and without any difficulty. Preserve the shape of the high lights, also the catch lights in the eyes. Never rub the shading of background over the head. Let all the shading of the background be at the sides. Back of shoulders, and extending above them a trifle, a little higher toward the edges of the portrait, a piece of Green's ink eraser can be used in the porte crayon holder to advantage at times for cleaning up shadows where they are too dark; also for working backgrounds. A jet black background is sometimes suitable for portraits where the drapery is white. This can be best made by rubbing the crayon all over the surface of the background, and then smoothing it up and rubbing it in with the finger or thumb. In making lace, rub in the shadows and rub in the half tones all over the lace. Then pick out the pattern and high lights with a piece of Green's ink eraser. In this way the effect obtained is beautiful, and it is the easiest way of doing it.

Point crayon work is much more difficult. The portrait is entirely stippled over with the point of a No. 3 black Conte crayon. Some artists use a crayon sharply pointed, and draw in lines very lightly over the shadows and cross them with parallel lines, making diamond-shaped interstices all through the shadowed side of portrait. The crayon must be worked very lightly in doing this class of work. For amateurs, we would advise them to stick to the stump and tortillons. Very fine portraits can be made by this method alone. Considerable practice will be necessary before the pupil will be able to execute fine portraits; but by following the directions given one may be able, after a little patient practice, to do a satisfactory piece of work.

The Work of Counting $150,000,000.

The money stored in the United States sub-treasury building on Wall Street is now being weighed and counted, and this is rather a more serious undertaking than the average citizen would suppose from his own experience at taking account of funds. The necessity for the count arises from the fact that assistant treasurer C. J. Canda is about to retire from office to be succeeded by Judge A. McCue. The retiring assistant treasurer must give an account of all funds that have come into his hands during his incumbency, in order that he may be released from liability under his bond, and may take a receipt from his successor for the amount turned over to him. The count is made by direction of the secretary of the treasury and treasurer at Washington. It is carried on under the immediate supervision of Major J. F. Meline, who has under him eight expert counters and weighers of money and eight able bookkeepers and accountants. These gentlemen, two other gentlemen appointed to look after the interests of the outgoing and incoming assistant treasurers respectively, and to represent them in the settlement of any disputed questions that may arise during the progress of the count, sixteen laborers to handle the coin, and an occasional honest-appearing representative of the press—these are the only witnesses of this interesting operation. The amount of money to be counted, weighed, and accounted for is, in round numbers, $150,000,000. In notes of various kinds and denominations, the count of which began on Tuesday, February 28, and is now finished, there were $25,000,000. The denominations of these notes ranged all the way from $1 to $10,000, and the number of them was about 440,000. When currency is put up in packages each of which contains notes of only one denomination (and care is taken at the sub-treasury that this shall be done), an expert and rapid counter, according to the estimate of Cashier William Sherer, can count, if the bills are in fairly good condition, about 6,000 per hour. Care is taken, as has been said, to have only bills of like denomination in the same package; but if a bill of another denomination has found its way into the package, as sometimes happens, the counter must detect it. When this fact is borne in mind, and the further fact that each counter of bills is responsible under a bond for the perfect accuracy of his work, it will be seen that to count 6,000 bills an hour, or 100 a minute, is pretty rapid work; but even at this rate it would take one man something over seventy-three hours to count the 440,000 bills which go to make up the $25,000,000 of currency in the sub-treasury.

The gold is weighed and estimated in the same manner as the standard silver dollars, a description of which will be found below. Up to Saturday night $49,000,000 in gold had been weighed and found not wanting, and $41,000,000 remained to do.

To weigh and count the silver is the most tedious task the counters have, because much of it is fractional silver which cannot be accurately estimated by weight, but must be laboriously counted piece by piece. Four and a half million dollars of silver have been counted, and about $34,000,000 remain, which of itself will occupy the whole force of counters for at least three weeks.

Of fractional silver there are about $10,000,000. Every piece of this must be handled and counted, because, owing to the loss by abrasion, no reliable estimate can be made of the amount by weight. Of two bags weighing about sixty pounds each, and each containing the same value of fractional silver, the weight will indicate, as a rule, a difference of from $5 to $10 in value, while cases have been known in which the difference has been as great as $30. Of quarters 4,000 pieces go to each bag, and a rapid counter will count ten bags a day. If the whole $10,000,000 of fractional silver, therefore, were in 25 cent pieces, as it fortunately is not, its counting would keep one man reasonably busy for the greater part of three years. When a bag is filled, it is marked with the initials of the counter, who is thenceforward responsible for the accuracy of his count.

Standard silver dollars are kept in linen bags, sixty pounds to the bag. The value of these bags can generally be determined by weight. The bags are passed from the vault in which they are stored to the scales, and thence, if they pass the test, they are removed to another vault. When a bag fails to pass the test, as about 1 per cent of them do, it is opened and the contents counted. It is generally found in such cases that the bag contains its full complement of dollars, which have suffered rather more than an average amount from abrasion. The weight in the other pan of the scales is a test bag of silver dollars which have been in circulation, with $1 added, because most of the silver being weighed has lain in the vaults for years and has been in circulation very little, if at all, and has not, therefore, suffered anything from abrasion. Some bags are found broken by the pressure under which they have lain, and their contents spilled about the floor. In such cases counting and rebagging are of course necessary. Some idea of the amount of pressure to which some of these bags are subjected may be had from the fact that they are stored in tiers, a tier containing as high as 800 bags in some cases, each bag weighing sixty pounds. The bags are handled by muscular 'longshoremen, but the work is so heavy and so constant that it is found impossible for even one of these men to work at it more than one hour at a time; so they work in relays, each working one hour and resting one hour alternately.

So far no discrepancy has been found between the count of coin and the books of the department, and it is not likely that any will be found. Many counts have been made of the funds in the nine sub-treasuries since their establishment, but no serious discrepancy has ever been found. It must not be understood that a change of officers is the only occasion on which an examination of the sub-treasury funds is made. On the contrary, assistant treasurers, for their own information and as a check upon any fraud that might exist in the department, institute such examinations very frequently. The cost of the present examination will probably not be less than $5,000.—*N. Y. Jour. Commerce, March* 12.

New Postal Arrangement with Canada.

By the new postal arrangement between the United States and Canada, which went into effect on March 1, 1888, articles will be allowed to go into either country, if admitted by the domestic law of either, except sealed packages (which are other than letters) and publications which violate the copyright laws of the country of destination, liquids, etc.

All articles exchanged under this arrangement are required to be fully prepaid with postage stamps, at the rate of postage applicable to similar articles in the domestic mails of the country of origin, and are required to be delivered free to addresses in the country of destination.

Articles other than letters, in their usual and ordinary form, on their arrival at the exchange post office of the country of destination, will be inspected by customs officers of that country, who will levy the proper customs duties upon any articles found to be dutiable under the laws of that country.

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Diphtheria from Poultry.

In the *Bulletin Medical* of January 22, 1888, Dr. Paulinis publishes an interesting report of an epidemic of diphtheria, occurring in one of the Grecian isles, which lends considerable weight to the arguments in support of this theory. The epidemic began in the summer of 1884, in Skiatos, a small island having a population of about four thousand souls. For over thirty years no case of diphtheria had been seen on the island, according to the testimony of a Dr. Bild, who had practiced there during that time. In the early part of June Dr. Paulinis was called to see a child aged twelve years, suffering from sore throat, and found her tonsils and pharynx covered with false membrane. This child died, and seven other cases occurred in the immediate neighborhood, five of them terminating fatally. The epidemic soon spread through the entire community, over one hundred being attacked, and thirty-six dying during five months.

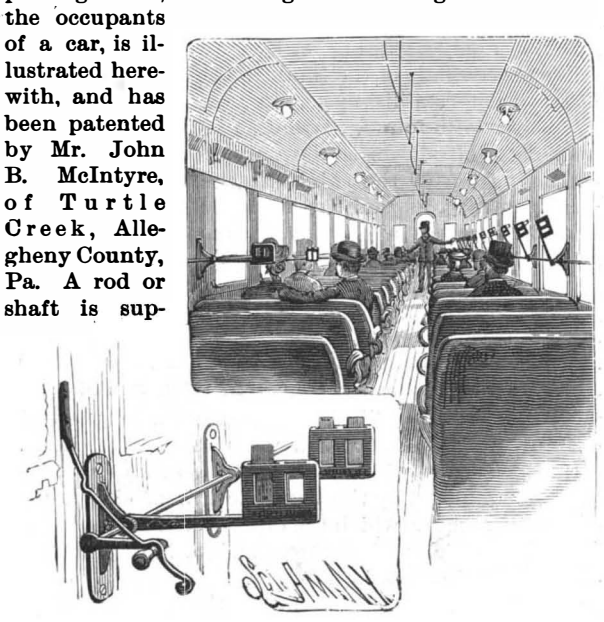
An examination was made to discover, if possible, the source of the disease, and it was found that a flock of turkeys had been received some three weeks before from Salonica. Two of the turkeys were sick on their arrival, and each of the others was attacked in succession. Dr. Paulinis found two of them still sick, and inspection showed patches of pseudo-membrane on the mucous membrane of the vault of the palate and of the pharynx. On detaching strips of the exudation by the forceps, the mucous membrane beneath was seen to bleed slightly. The glands of the neck were swollen, and in one of the fowls the diphtheritic process had extended to the larynx, as was shown by the hoarseness of the cry and evident dyspnœa. One of the turkeys, which had recovered from the throat affection, suffered from paralysis of the legs, being unable to walk. The garden where the turkeys were was at the northern extremity of the town, and the first children attacked were in the immediate neighborhood. There had been no immediate contact between the fowls and the children, nor between the first child attacked and the others, but there was a north wind blowing the greater part of the time, and the author believed that it was in this way that the disease was spread. He concluded, from this experience, that the diphtheria of the ordinary barn yard fowls was similar in its course and symptoms to the disease occurring in man, and that it could be carried from the one to the other, sometimes through the medium of the air.—*Medical Record.*

The Philadelphia Manual Training School.

The second annual catalogue of this institution affords evidence that its work is now well under way, there being 283 students in the school. The school affords an opportunity to those who have finished the ordinary grammar school course to continue their literary, scientific, and mathematical studies, and also receive a course in drawing, and in the use and application of tools in the industrial arts. The combined course of study covers three years, the time of the pupils being divided into one hour per day for drawing, two hours to shop work, and three hours to the usual academic studies. This school is supplementary to the public schools of Philadelphia, admission thereto being obtained by promotion from the other schools.

A TICKET AND CHECK HOLDER FOR RAILROAD CARS.

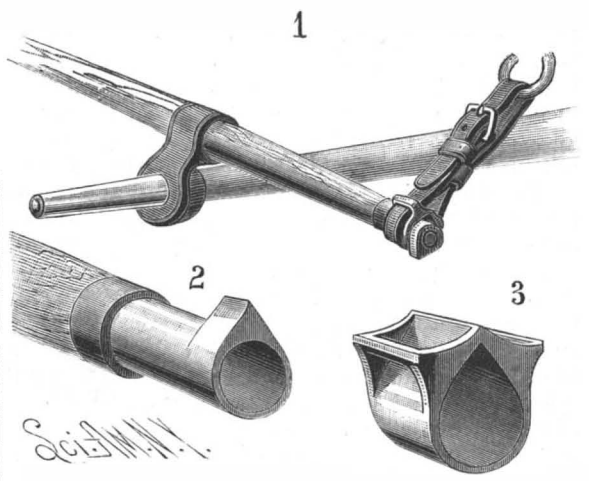
A novel device designed to be attached to railroad passenger cars, for holding and checking the tickets of the occupants of a car, is illustrated herewith, and has been patented by Mr. John B. McIntyre, of Turtle Creek, Allegheny County, Pa. A rod or shaft is supported in suitable holders lengthwise on each side of the car, above the seats, the shaft carrying perforated ticket receivers, which, on turning the shaft in one direction, are lowered, and on turning it in the opposite direction are raised to be out of the way. These ticket receivers are on the ends of short arms secured to the shaft, one arm with a receiver for two tickets for each double seat, the tickets being plainly seen through openings in the receiver. Each shaft has an end crank or bent portion, upon which a spring catch engages to hold the shaft in a position that will keep the ticket receivers raised or out of the way, or turned down to receive the tickets, as when a conductor is passing through the car and punching them; the conductor, after lifting all the tickets in the car, operating the crank end of the shaft to lift the ticket holders out of the way.



McINTYRE'S TICKET HOLDER FOR RAILROAD CARS.

AN IMPROVED NECK YOKE FASTENING.

A detachable fastening, whereby the strap connecting the ends of the neck yoke with the harness collar need not be buckled or unbuckled, but can be simply attached or detached, is illustrated herewith, and has been patented by Messrs. Adolph P. and William C. Koch, of Effingham, Ill. It is a metal sleeve of novel form, shown in Fig. 2, adapted to receive and retain a collar strap, and to slip over the ferrule or point on the end of a neck yoke shown in Fig. 3, the ferrule having a projection on its end corresponding in form with a recess in the sleeve. In use the collar strap is attached to the detachable sleeve, which is then slipped over the ferrule while its point or projection is turned upward, to permit its passing through the corresponding recess in the sleeve, after which it is turned down to the position shown in Fig. 1, by which the sleeve is securely held in position on the neck yoke, being disengaged by reversing this operation.



KOCH BROS.' NECK YOKE FASTENING.

Proposed Increase in the Patent Office Staff.

A correspondent of the New York *Tribune* says: An item in the legislative appropriation bill, which was lately submitted to the House by the appropriations committee, provides for the appointment of thirteen additional examiners for the Patent Office, and for twelve more $1,200 clerks. The committee has also so shaped the appropriation for the Land Office that the law providing for the evicting of the Land Office from the Interior department building in December must be enforced. This will in itself accomplish much toward heightening the efficiency of the Patent Office force, which has been crowded together until the breathing of foul air and the necessity of climbing over somebody every time one moved from his seat seriously interfered with the progress of the work.

Two of the new positions thus provided for will be for principal examiners, and thus two new divisions will be created to aid the present twenty-nine divisions in disposing of the ever increasing volume of business pouring in upon the office. Mr. Butterworth, of Ohio, who was Commissioner of Patents under President Arthur, introduced the matter to the attention of the committee and procured the incorporation of the above provisions in the bill. If he was as successful in convincing the members of the House at large that the Patent Office should be run upon a non-partisan basis for the benefit of American inventors, who pay the bills, as he was in driving that point to the mental consciousness of his colleagues on the appropriations committee, Saturday, that item of the bill will go through untouched. It certainly does seem absurd that any picayune considerations of "reform" economy should keep Congress from appropriating sufficient sums out of the money which inventors pay into the treasury promptly to transact the joint business of the inventors and the government.

All salaries and expenses of the Patent Office, together with expenses of conducting and maintaining the great building popularly known as "The Patent Office," but which also contains the office of the Secretary of the Interior, his assistant secretaries, and clerks, are paid out of the patent fund. This fund is replenished by the fees paid by the inventors at various stages of Patent Office action upon their applications for patents. Not a cent comes out of the government's pockets for the support of the Patent Office. On the contrary, the surplus of the fund is continually increasing, and is now about $3,000,000. This vast amount of money sucked from the pockets of American inventors—who are generally poor as church mice—lies idle in the treasury, while their business in the Patent Office is so far in arrears through an inadequate force and inadequate accommodations that in some cases six months pass after an application has been filed before it is heard from, and after that a period of three months must elapse after each letter written in the case by the inventor before he gets an answer. Consequently, where there happens to be a difference of opinion between the examiner and inventor as to the scope of his claims, the case may drag on for years, while the new art is advancing at the rapid rate of mechanical development of the present age, some other inventors are coming in with conflicting applications, and endless confusion results, to the loss of the inventor, the vexation of the examiner, and the fattening of the patent lawyer. One can imagine the high rate of speed with which an argument advances, when three months pass between the statement of each proposition and the answer thereto.

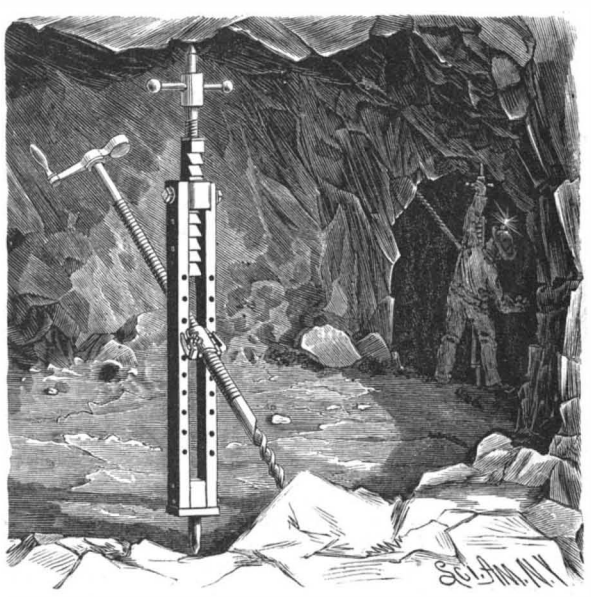
In the face of all this the appropriations committee every year cuts down the salary of the principal examiners in the Patent Office to $2,400, while the law says they shall be $2,500, while chiefs of divisions in the treasury of the same rank get the full $2,500 for work which does not require the abilities and special knowledge called out in the daily decisions in the Patent Office upon rights involving thousands of dollars, and turning upon the finest legal and scientific points; and while the surplus Patent Office fund goes on accumulating.

Fluorine a Universal Solvent.

Iron gives an interesting account of what it calls the universal solvent, and which it declares, though long known to modern chemistry, has only just been separated, and cannot even now be retained in its isolated state, simply because it destroys everything. This fury of the chemical world, it goes on to say, is the element fluorine. It exists peacefully in company with calcium in fluorspar, and also in a few other compounds; but when isolated, as it recently has been by Henri Moissan, it is a rabid gas that nothing can resist. It combines with all metals explosively. When they are already combined with some other non-metallic element, it tears them from it and takes them to itself. In uniting with sodium, potassium, calcium, magnesium, and aluminum the metals become heated even to redness by the fervor of its embrace. Iron filings, slightly warmed, burst into brilliant scintillations when exposed to it. Manganese does the same. Even the noble metals, which at melting heat proudly resist the fascinations of oxygen, succumb to this chemical siren. At a moderate temperature glass is devoured at once, and water ceases to be water by contact with this gas.

AN IMPROVED HAND DRILL FOR MINERS.

A device which permits a quick and sure adjustment of the drilling tool and the drilling post for hand drilling is illustrated herewith, and has been patented by Mr. James O. Patridge, of Wellston, Ohio. The post consists of two uprights connected at the bottom by a cross piece having a downwardly extending point, the cross piece at the upper end having a square aperture into which fits a hollow bar with teeth on one edge adapted to be engaged by a supporting plate, the bar being internally threaded to receive a screw rod having a point on its upper end, and with handles for turning the rod in the threaded bar, whereby the post is firmly fixed in position by the points being forced into the bottom and ceiling or sides of the mine. The two uprights of the post have apertures in their front edges in which is held a vertically adjustable nut of peculiar construction, into which screws the threaded shank of the drilling tool, the nut consisting of two parts hinged together so that one part can be thrown open for the admission of the drilling tool. With this construction the post can be quickly and accurately fixed in varying locations, and the drilling tool placed ready for work in any desired position.



PATRIDGE'S HAND ROCK DRILL.

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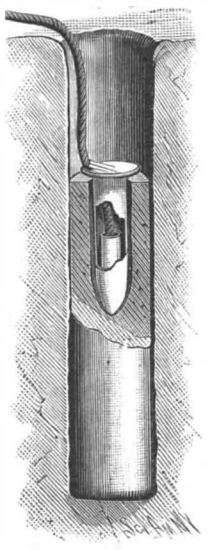
IMPROVED CAP PROTECTOR FOR CARTRIDGES.

A protector and shield for the percussion fuses of dynamite cartridges, to prevent accident in case the fuse fails to explode and it becomes necessary to remove the cartridge, is illustrated herewith, and has been patented by Messrs. Thomas De Coar and William Keast, of Russell Gulch, Col. The shield is pointed at one end and has at the other end a head, slit to form an opening through which the cap is introduced, the cut made by slitting forming a lid which may be bent down to partly close the opening after the introduction of the cap. By the employment of this shield the cap is saved from being injured by tamping, while its efficiency in exploding the cartridge is not diminished, and in case of the failure of the cap to explode it may be safely withdrawn, the head affording facilities for grappling the shield without disturbing the cap.



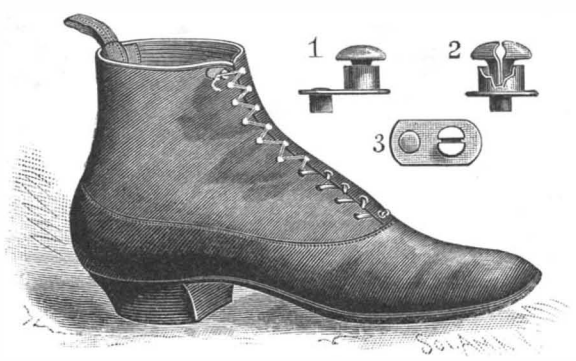
CAP SHIELD FOR CARTRIDGES.

A Large Torpedo Shell.

One of the new elements of construction rendered necessary by the invention of the dynamite gun by Captain E. L. Zalinski has been the need of a brass shell for the projectile. Brown & Brothers, a firm in Waterbury, Conn., have succeeded in making a shell of seamless drawn brass, with conical head, 3-16 inch in thickness, and weighing 200 pounds. Its length is 6 feet 8 inches, and inside diameter 14 inches, the whole being in one piece produced by the cold flow of the metal drawn into shape with the hydraulic ram. This shell is designed for the purpose of carrying 600 pounds of explosive gelatine for the dynamite gun.

AN IMPROVED FASTENING FOR LACING CORDS.

A simple device particularly designed to facilitate the lacing of shoes has been patented by Mr. George M. Sawyer, of Glens Falls, N. Y., and is illustrated herewith. It consists of a lacing fastener having a small flange or plate with a hollow rivet projection on its under side at one end, to be passed through the leather and clinched on the under side, while on the opposite outer surface of this flange is a cylindrical post of a length sufficient to receive one or two turns of the free end of the lacing cord. This post is fitted at its top with a split spring, as shown in Fig. 2, terminating



SAWYER'S FASTENING FOR LACING CORDS.

two opening and closing jaws, adapted to receive the free end of the lacing cord, after the shoe has been laced up, and one or two turns of the cord have been passed around the post.

Defective Chimney Flues.

There is no greater evil in existence to-day in the construction of buildings, says the *Plumbers' Journal*, than the present system of constructing chimneys. The grouping of separate small, narrow, and crooked flues is a great source of complaint in almost every dwelling where so built.

The remedy for same, the editor thinks, would be the construction of one large flue extending from cellar to the highest available point, with branches from each floor running up and connecting at the ceiling of the floor above, or direct at each floor to the main flue. In this manner a guaranteed upward draught at all times would be assured.

Go into any dwelling to-day, and what do you find? For instance, light a fire in the rear parlor, and the draught will be down the front parlor flue, through the hall and room, and up through the rear parlor flue, or *vice versa*, down the rear parlor flue and up the front parlor flue. When that is not the case, on the opening of a window or door, an immediate counter current is the consequence, all which certainly and clearly demonstrates that our method in house construction of chimneys is far from perfection. We calculate by the building of one large main flue, into which all branches should be carried direct from each floor or apartment, is the only safe and true method by which the evil now complained of can be overcome, and the lungs be spared from the poisonous gases they are now forced to inhale, as it is a well known fact that no gases are more poisonous than those of sulphureted hydrogen or coal gas that permeates our dwellings.

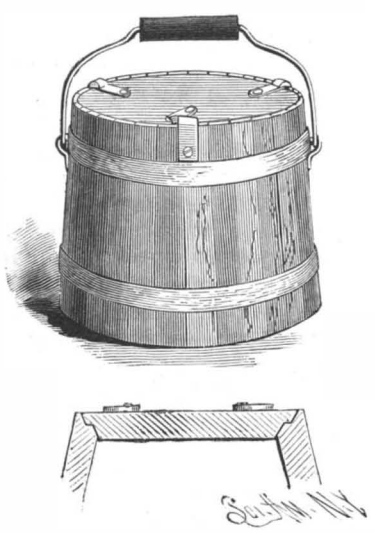
From whence the barbarous practice of constructing our chimney flues in the separate system emanated we know not; but whoever instituted that system, if held responsible for the deaths caused by it, would have a great deal to answer for.

We trust and hope our remarks on this subject will not go unheeded, as a careful observation of any one in their own house will go to prove and substantiate whatever we claim. We need not carry the examination into any other house, but look in our own to satisfy ourselves of the glaring and dangerous defects, as demonstrated herein. We have but to apply the simple principles in ventilation to prove our assertion. As rarefied air expands, it therefore requires a greater area of space in order to travel upward. This principle is wholly ignored in the construction of our chimneys.

What the objection can be to one large flue with an area guaranteeing an upward current at all times, we certainly are at a loss to know. In the good old days of yore we frequently heard it said that we had healthy homes and less sickness than at the present day. In those days we had flues constructed of the capacity that we speak of, that always guaranteed ventilation and pure atmosphere to breathe. Therefore, let the separate flue system be condemned at once, and we will have stronger walls, purer air, and healthier homes, and plumbing would come in for less misapplied complaints, when in reality the cause emanates from the defects we speak of.

AN IMPROVED BUTTER TUB.

A butter tub having an air tight cover, and provided with a simple and effective fastener, is illustrated herewith, and has been patented by Mr. Alexander C. Howe, of Idana, Kansas. The chine of the tub is grooved, or made in two diameters, and is flared outwardly to receive the beveled rabbeted edge of the cover, arranged to fit tightly in the grooved chine of the tub, so that when pressed down into place it will be practically air tight. Near the rim of the tub are fastened right-angled clips which extend over the chine, and to the top of the cover are pivoted latches with beveled ends, adapted to wedge under the ends of the clips, thus forcing the cover downward into the chine, and holding it securely in place.



HOWE'S BUTTER TUB.

Six-Wheel Trucks for Freight Cars.

At a recent meeting of the Western Railway Club, Mr. J. N. Barr read a paper as above. The arguments in favor of such a construction were:

First.—It is very likely that a much smoother riding car would be obtained. This would have a beneficial effect on the entire structure. For some kinds of traffic, as live stock, an improvement in the motion of the car would be a decided advantage.

Second.—The increase in bearing surface would not be affected by increased velocity of the bearing surface, as is the case when the journal diameter is increased.

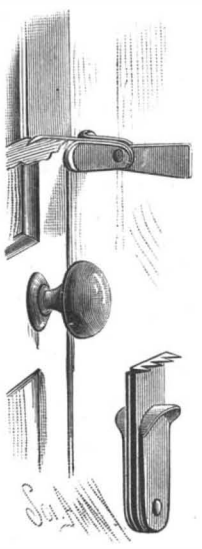
Third.—It is generally conceded that wheels under cars of 40,000 pounds capacity are subjected to a service very nearly equal to their safe limit of strength. The addition of two more wheels will distribute the load of the heavier cars, so that no heavier duty will be required of the wheels as a whole.

This difficulty might be met, to a certain extent, by increasing the weight of the wheel. The increased pressure between the wheel and the rail, however, will, in four-wheel trucks, cause much more rapid wear in the wheels, and likely in the rails, and will also enhance decidedly the effect of any flat spots or irregularities in the wheel or in the track. In the six-wheel truck the distribution of the load will have a tendency to reduce the causes of destruction just named.

Fourth.—In the case of breakage of wheels or axles, the tendency to derailment and extensive damage is very decidedly in favor of the six-wheel truck. In fact, with a good six-wheel truck the liability to derailment in case of a broken wheel or axle is not great, while with four-wheel trucks such breakage will almost certainly produce derailment.

AN IMPROVED DOOR FASTENER.

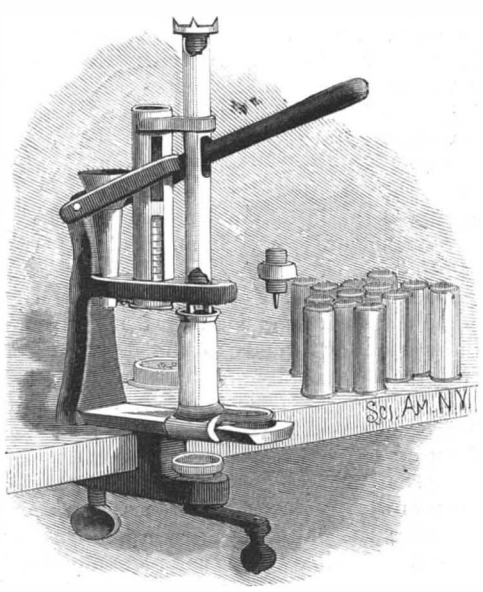
A door fastener which is adapted to be caught in the crack between the door and jamb, so as to hold the door closed without reference to the lock or bolt, has been designed by Mr. Edward Kendall, of McCook, Red Willow County, Neb., and is illustrated herewith. It consists of a toothed plate with pivoted abutment plates and a wedge plate, the device being shown folded in one of the views. To apply the fastener, the toothed plate is opened out singly and laid against the rabbet in the door jamb, with its teeth toward the jamb, when the closing of the door forces the teeth into the wood of the jamb, and the outside abutment plates are turned over against the door and door casing. If the crack between the door and its jamb is very large, the wedge plate is also turned over parallel with the back of the toothed plate. The device is especially designed to be used in hotel rooms and other places where the lock of the door is liable to be picked or opened with a false key after having been locked on the inside.



KENDALL'S DOOR FASTENER.

A COMBINATION TOOL FOR LOADING CARTRIDGES.

A machine for loading the ordinary form of paper shell cartridges, whereby the exploded primers may be removed and new ones applied, and the shell loaded and crimped, is illustrated herewith, and has been patented by Mr. Francis P. Devens, of No. 1306 Forest Avenue, Kansas City, Mo. In loading cartridges, the shells are passed up through the aperture in the forward end of the clamp plate into the shell tube, which is then moved back so that its upper end will be beneath the funnel-like filler at the rear. The proper charge of powder having been supplied, the tube, in being moved forward to the position shown in the illustration, withdraws a wad from the central wad tube, which is forced down within the cartridge by the depression of the lever. The capping and decapping device, which screws into the lower end of the plunger, is shown in a small figure, its convex upper face being used for capping, while the projection carrying a pin is adapted to remove an exploded primer from the anvil of the cartridge. If two wads are to be placed on top of the powder, the shell tube is again passed under the wad tube, when another wad is extracted and pressed home by the plunger as before, after which the shell tube is passed back to the funnel-like filler for its charge of shot, extracting another wad as it is again moved backward, which is forced to place in a similar way. The crimper consists of a block mounted on a short shaft supported beneath the forward end of the clamp plate, there being an annular groove in the upper face of the block, and its lower edge being formed of cam faces, the shaft being operated by a crank arm. The open end of the cartridge is first depressed by a claw adapted to engage with the thread of the plunger, so that it will enter the annular groove in the upper face of the crimping block, when, by a slight downward pressure on the lever, at the same



DEVENS' CARTRIDGE LOADER.

time rotating the crank arm, the edge of the shell will be turned over and properly crimped. As will be seen, this implement may be used as a loader, a capper and decapper, and as a crimper.

THE Springfield (Mass.) Foundry Company, in a circular, remind their workmen that "the average loss on a bad casting is from five to seven times the profit on a good one."

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THE VOLNEY W. MASON HOISTING MACHINERY AT THE GREAT HAY DEPOT OF THE NEW YORK CENTRAL RAILWAY, NEW YORK CITY.

The illustrations on our front page this week show the construction and operation of probably the most extensive collection of hoisting machinery ever assembled and operated in one establishment. We allude to the new hay depot, 33d Street and 11th Avenue, New York.

When this great structure was projected by the New York Central and Hudson River R.R. Co., its officials made careful investigations in respect to hoisting machinery, and finally decided upon the apparatus of Volney W. Mason & Co., of Providence, R. I. Their mechanism was held to be superior in all respects, and was promptly adopted. The practical results fully justify the wisdom of the selection. The long line of power hoisting machinery, by which the bales of hay are quickly transferred from a train of cars to the lofts, and the appliances through the means of which deliveries are readily effected therefrom to the dealers, all work with a smoothness and economy which, apparently, leaves nothing to be desired.

There are 61 hoisting machines driven by a main line shaft having its bearings in the top of each machine, there being fast on the shaft over each machine a paper friction wheel, while the hoisting machine below carries a winding drum, with a larger friction wheel on its side, which is caused to engage with the paper friction wheel over it by means of a double eccentric, *i. e.*, two cam bearings, one each side of the machine frame, connected by one lever. Pulling upward on the lever causes the drum and wheel to come into contact by a parallel movement toward the running wheel, friction contact causing the drum to wind up the hoisting wire rope as far as desired. On releasing the lever, it falls back, and the wheel drops on a leather brake shoe on the under side of the wheel, holding the load stationary, the lowering away being accomplished by lifting the lever off the brake between the brake and driving wheel—lowering away, hoisting, or holding the load being controlled, as required, by the movement of the lever, the load being always held at rest by the brake upon letting go the controlling lever.

The arrangement of the shafting presents an interesting feature, there being seven level lines, each eighty feet long, and each line one foot lower than the other from Eleventh Avenue toward the Hudson River, the lines each being connected, as shown in one of the views, by a pair of universal couplings and a piece of shaft six feet long, on an incline or angle dropping one foot in six feet. The power is furnished by two Westinghouse engines of 25 h. p. each, running at a speed of 390 revolutions per minute, on to two friction pulleys, 54 in. diameter and 8 in. face each, on the main shaft in the top story. By using these pulleys, which are a new style of balanced segment friction pulleys, designed by Messrs. Volney W. Mason & Co., and a detail view of which is given at the top of the page, either of the engines may be thrown on or off instantly, when running at speed or stopped, so that either engine can be used separately, or both together, to drive the main shafting, as required. This pulley was especially designed for running continuously on main line shafting, for driving electric light, dynamo, and other machinery, started and stopped from the main shafting, and many pulleys made after this pattern have been put in operation, giving great satisfaction.

The hoisting and delivering apparatus is shown in detail in one of the small views, the same apparatus sufficing for both purposes. The hay is hoisted from the cars or platform, on the north side of the building, into the several stories, as desired, and delivered to the dealers' teams, on the south side of the building. The storage capacity of the building is about six thousand tons, the new structure taking the place of an old one, destroyed by fire in June, 1887, and having all the latest improvements. The offices of the hay dealers are located in an adjoining building, on Eleventh Avenue.

Mr. Mason, of the firm of Volney W. Mason & Co., commenced the business of making friction pulleys in 1860, and personally attends to the designing of the new patterns continually required in the business, which has been one of steady growth from the start. The firm are located at Providence, R. I., and are manufacturers of friction pulleys, friction clutches for connecting shafting and gearing, hoisting machinery, and elevators with self-closing hatches. The contract for furnishing the entire hoisting apparatus for the new hay elevator called for the completion of the work in sixty days from the date of the approval of the plans, and the firm had the whole plant in place and ready for operation within the time specified.

New Artesian Wells at Paris, France.

The artesian well which has been in course of construction at the Place Hebert, Paris, France, for the past twenty-two years, has just been completed. The water bed lies at a depth of 719 m. 20 c. (about 2,400 ft.) from the surface of the soil. Paris now possesses three artesian wells, viz., at Grenelle, Passy, and the Place Hebert.

EXPERIMENTS ILLUSTRATING THE PRINCIPLE OF THE DYNAMO.

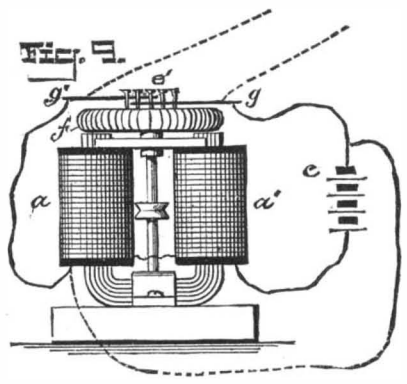
BY GEO. M. HOPKINS.

II.

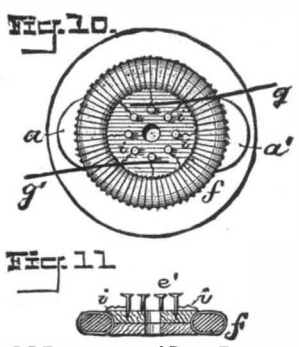
After noticing the effect of plunging a magnet into a coil of wire, it is not very difficult, in the light of present electrical knowledge, to understand how the process of induction is carried on in a continuous way in the armature of a dynamo.

The simplest form of armature for illustrating this point is undoubtedly that known as the Gramme ring armature. In the action of this armature the prime factor is magnetic induction. It is perhaps unnecessary to go into the details of the construction of the Gramme ring, as commonly used in dynamos. A very crude ring answers the present purpose. Its core is formed of a compact circular coil of soft iron wire, which, in cross section, may be circular or of any other form. The core is wrapped with tape and varnished to insure insulation.

Around this iron ring or core is wound an insulated copper wire, arranged in a spiral coil *f*, like the winding of an ordinary electro-magnet. The ends of the copper winding are joined by soldering, thus forming a closed coil. The ring is mounted upon a circular wooden support attached to a spindle, so that the armature may be revolved in front of the poles of a magnet, *a a'*, as shown in Fig. 9. In the wooden support, in a circle concentric with and near the spindle, are inserted six or eight wire nails, *e'*, arranged at equidistant points. The copper winding of the ring is spaced off into as many sections as there are nails in the circular row, and at the end of each section the insulation of the copper wire is removed a short distance, and a wire, *i*, is attached by soldering. These attached wires are each connected with one of the wire nails. Now, all that remains to complete the Gramme dynamo or motor is the application of two conducters, *g g'*, to the circular row of wire nails, as shown in Figs. 10 and 11.



GRAMME MACHINE FOR ILLUSTRATION.



DETAILS OF ARMATURE.

This dynamo has all of the essential features of the regular machine—the field magnet, the iron armature core, the conductor wound upon the core, the commutator cylinder formed of the wire nails, and the brushes consisting of wires held on opposite sides of the commutator cylinder.

This dynamo is constructed for illustration only, and not for practical use. It will generate a current, and may be driven as a motor by a current, but of course not with the same advantage as a more complete machine.

In investigating the phenomena of the armature, it is well to begin with the simplest case of magnetic induction. When a bar of soft iron is held before the poles of a magnet, as shown in Fig. 12, it becomes itself a magnet. The magnetism developed in the bar by the action of the magnet is opposite that of the magnet. That is, the magnetism developed in the end of the bar opposite the N pole of the magnet is S, and, similarly, the magnetism developed in the end of the bar opposite the S pole is N. The center of the iron bar is neutral.

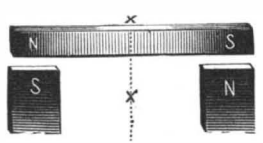


Fig. 12.—Magnetic Induction.

By substituting an iron ring for the straight bar, as shown in Fig. 13, the effect will be the same. The portions of the ring opposite the poles of the magnet acquire polarity by induction, as in the first instance, and the magnetism extends in the ring from the vicinity of the poles toward the neutral line, X X, which forms a right angle with a line joining the poles of the magnet. In the figure of the ring the location of the magnetism in the ring is indicated by the shading.

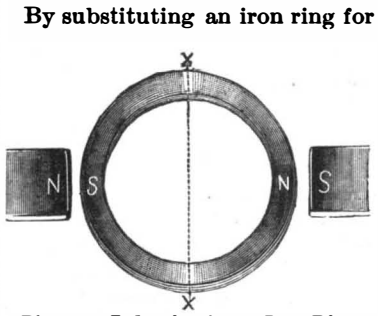


Fig. 13.—Induction in an Iron Ring.

By turning the ring upon its axis, the mass of the ring moves, but the polarity of the ring maintains a fixed position relative to the poles of the magnet.

When the ring carries a coil, as shown in Fig. 14, the magnetic poles of the ring remaining stationary, while the material of the ring and coil are revolved, there is a continual passing of the sections of the coil through the magnetic field surrounding the polarized portions of the armature core and the poles of the magnet, which is the same in effect as the passing of a magnetic bar through the coil of the armature.

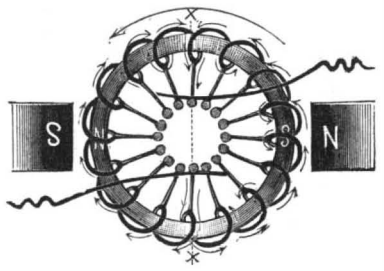


Fig. 14.—Armature in Magnetic Field.

Besides the inductive effect produced by the magnetization of the armature core, the passing of the conductor through the magnetic field of the inducing magnet augments the current.

Each half of the armature between the neutral points is practically a single coil of wire, terminating at two of the commutator bars—which in the present case are the two nails—at diametrically opposide sides of the commutator cylinder; all of the remaining commutator bars and their connections being idle.

In Fig. 9, two circuits are shown in connection with the machine—one in full lines, the other partly in dotted lines, both connected with the battery, *c*. When the circuit represented in full lines only is employed, the machine runs as a motor. When the wires shown by full lines are disconnected from the brushes, *g g'*, the rotation of the armature in the field of the magnet, *a a'*, produces a current in the manner already indicated, and this current is taken from the armature by the way of the wires, *i*, the nails, *e'*, and the brushes, *g g'*.

This machine when used as a generator is strictly a magneto-electric machine, although an electro-magnet is employed as a field magnet. A permanent magnet might be substituted for the electro-magnet.

For the sake of securing the greatest possible simplicity, certain modifications of the action of the armature have been omitted.

A Lost Locomotive.

"In the construction of the Kansas Pacific and Atchison, Topeka & Santa Fe railroads," said H. L. Carter, a railroad contractor of St. Joseph, the other day, "one difficulty of frequent occurrence was met with, which, as far as my experience goes, is unique in railroad history. I refer to the trouble arising from quicksands. From Western Kansas to the mountains, quicksands are to be found in nearly every stream, no matter how small, and to successfully bridge them required an expenditure out of all proportion to the size of stream to be crossed. We tried pile driving, but the longest piles disappeared without touching the bottom. Then filling with earth and stone was attempted, and met with equally poor success, as the quicksand was apparently capable of swallowing the entire Rocky Mountains. The only means of crossing was found to be to build short truss bridges across them. This was very expensive, but was the only thing to be done. As an instance of the practically bottomless nature of the quicksands, I may cite the case of an engine that ran off the track at River Bend, about ninety miles from Denver, on the Kansas Pacific. The engine, a large freight, fell into a quicksand, and in twenty minutes had entirely disappeared. Within two days the company sent out a gang of men and a wrecking train to raise the engine. To their surprise they could not find a trace of it. Careful search was made, magnetized rods were sunk to the depth of sixty-five feet, but no engine could be found. It had sunk beyond human ken, and from that day to this has never been discovered. Cattle and horses are frequently lost, the only animal that is safe being a mule—the only animal that never gets caught. No greater instance of the same intelligence of this much maligned quadruped can be cited than the skill and care with which it avoids all unsound bottom. As its hoofs are much smaller and narrower than those of a horse, it would mire down in places where a horse could safely pass. Recognizing this fact, whenever a mule feels the ground giving away under its feet, it draws back instantly and cannot be induced to advance a step, although a whole drove of horses may have immediately preceded. Those who think a mule is stupid are much mistaken."

Curious Alloy.

Put into a clean crucible an ounce of copper and an ounce of antimony. Fuse them by a strong heat, and pour the alloy into a mould. The compound will be very hard and of a beautiful violet hue. This alloy has not yet been applied to any useful purposes; but its excellent qualities, independent of its color, entitle it to consideration.

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Correspondence.

Another Remedy for Ivy Poison.

To the Editor of the Scientific American:

I have noticed a number of brief articles upon the subject of ivy poison and its remedies, in your valuable paper, and am led by them to offer the experience of an amateur botanist with this dreaded vine. During the past ten summers, your humble correspondent has been blistered two or three times each season, with Rhus toxicodendron, and has tried about every remedy known to the physician or to the old ladies, who always have a remedy for every ailment. No remedy which I have tried has been so speedy and effectual as the bruised leaves of nightshade (Solanum nigrum), and cream. This remedy is safe and simple, and should be applied like a poultice to the affected parts.

EDWIN S. LINK.

Kirksville, Mo.

Ivy Poisoning.

To the Editor of the Scientific American:

Referring to the article in your paper of April 7, by Mr. Jessop, who says he has never found a *sure cure* for ivy poisoning, like Mr. J. I was repeatedly poisoned by ivy when a boy, and found no relief till an uncle told my mother to give me a tablespoonful of thoroughwort tea each morning before eating during the month of May, and I never would be poisoned again. She followed his directions, and the result was I never have been poisoned since, although I was exposed to it more or less each summer for a number of years afterward. The above may not be a *sure cure* in all cases, but it is worth trying, as it can do no harm if it does no good.

ALBERT S. TRASK.

St. Paul's School, Concord, N. H., April 9, 1888.

An Ohio Gas Well.

To the Editor of the Scientific American:

Thinking it might be of interest to your readers, I herewith state you something of one of our gas wells here, of which we have quite a number in our county, among them some good ones. The well referred to was closed in 1887, but seems to have been leaking, at least some way or another it caught fire, and the woodwork burned away, leaving it the chance of partially leaking. This happened about three months ago, and it has been burning ever since. Now lately it starts to make a fearful noise. The well is about six miles west of my house, and I can hear it very plainly and distinctly. The sound is very irregular and is like the sound of a good thundering of a coming thunder storm, then stopping for awhile, then at once the roaring, thundering sound starts again. It seems to be subterranean, making the feeling as if the earth was shaking, but only then when the thundering sound is there.

I have been at the well and found a moderate gas flame, seeming to be the gas leaking out between casing and pipe proper, which pipe is closed by two valves. The casing projects about 2 feet out of earth, and pipe about 2 feet out of casing. Now the pipe is leaking at a point about 2 feet above casing, where it has an elbow with a horizontal pipe having the valves, and it seems that the sound is caused by the vapor coming out of pipe, and which seems to be no gas, as very little of it burns, although the fire of the leaking gas from between casing and this pipe burns right under it, and ought certainly to ignite it. I have tried and diverged this egressing gas by holding a piece of long board near orifice, then a little more of it burns.

Has anything of the kind been ever before experienced, and what may be the cause of it? Should like to hear others on this subject, as it is quite new to us.

J. M. KRAMER.

Maria Stein, Mercer County, Ohio, April 2, 1888.

The Boston Hot Water System.

To the Editor of the Scientific American:

In your issue of April 14, under the head of "Hot Water System," you said that the pipes of the new system of heating by hot water, in Boston, are clothed with mineral wool.

We take the liberty of calling your attention to the fact that these pipes (some eight miles in all) are clothed with our patent fire felt covering, which is composed entirely of pure asbestos, with an outer waterproof jacket, which is laced over the covering.

The peculiar feature of this covering of especial interest to mechanical men is the fact that it will stand both heat and moisture, an advantage not secured by the ordinary methods of covering pipes.

THE CHALMERS-SPENCE CO.

New York, April 12, 1888.

STRIKES IN THE UNITED STATES.—Striking was one of the principal occupations of the laborers of the United States in 1887. According to an estimate in *Bradstreet's*, the total number of strikes for the year was 858, involving 340,854 laborers.

Compressed Air Tramcar.

On the lines of the London Street Tramways Company, between King's Cross (Metropolitan) Station and Camden Road, Holloway, several tramcars are to be seen in regular work propelled by compressed air on the Mekarski system. The journey undertaken by these cars is a little less than two miles in length, and is on a rising and falling gradient all the way, there being a length of 100 yards with a gradient of 1 in 27, with a curve of about 50 feet radius at the top of it, while in another part of the line, for a length of nearly three-quarters of a mile, the gradient varies from 1 in 60 to 1 in 40. The rails have been laid for a very considerable time, and are of shallow depth, supported on the old fashioned longitudinal wooden sleepers, so that the track is not nearly so well able to carry a heavy car as if it were laid on the girder rail system. Altogether the route is a very difficult one, and if the air-driven cars are successful in running upon it for a fair length of time, their capacity for complying with the conditions of tramway traffic met with in this country will be more than demonstrated.

The Mekarski cars have been running in the town of Nantes, in France, for some years, but they have had to be very considerably modified to adapt them to the conditions imposed by the board of trade in this country and to the requirements of the tramway companies. The work has been carried out in Sir Frederick Bramwell's office under the superintendence of Mr. H. G. Harris, and amounts to a practical redesigning of the entire arrangement. The distinctive features of the original invention are retained, but the mechanical arrangements have been worked out afresh, and it is upon the suitability and perfection of the mechanical arrangements that the success of a tramway locomotive depends. One of these new cars appeared at the Inventions Exhibition, where it carried many thousands of passengers backward and forward over a short course, without the slightest hitch, and now five of them are going to be submitted to an extended trial under the very difficult conditions we have already alluded to, with a view of affording practical proof of their suitability for competition with horse traction.

The cars are 4 feet 8½ inches in gauge, and each is capable of carrying thirty-eight passengers in addition to the driver and conductor, the general appearance being very similar to that of a horse car, except that the floor is at a somewhat higher level to give space for the machinery underneath. The compressed air is carried in six horizontal cylinders or reservoirs, three at each end of the car, below the floor. Five of these reservoirs are connected together by pipes, and are called the battery, while the sixth is independent, and is called the reserve. These cylinders are filled with compressed air at a pressure of 450 pounds on the square inch. This air, however, does not furnish the entire motive power for driving the car. It is a special feature of the Mekarski system that a store of heat is carried in two "hot pots," one at each end of the car, and is gradually transferred to the air, thus preventing the formation of ice and snow in the cylinders, and to some extent increasing its volume. The hot pots are filled with water from a steam boiler working at a pressure of 80 pounds to the square inch, at the same time that the store of air is received. The heat is transmitted to the air by causing the latter to bubble up through the water on its way to the high pressure cylinder of the engine, and by conducting it, after it has been expanded in this cylinder, through a heater immersed in the water before it passes to the second cylinder. By this arrangement the air is twice heated, first by direct contact with the water, during which it picks up sufficient moisture to lubricate the valves and pistons, and second by passing through heated tubes of considerable surface. Normally, the air from the battery is admitted to the hot pot and so to the engine cylinders, but should a very steep rise be encountered at the end of a long run after the air pressure has fallen, or should a stop be made half way up a hill, then the battery can be shut off, if necessary, and air at the full pressure of 450 pounds be admitted from the reserve reservoir. This reserve is not touched except in emergencies of this kind, and can be relied to pull the car through any possible difficulties that it can encounter. A regulating valve is fixed at the top of each hot pot, a single hand wheel being provided for the two, so that the one out of use cannot be tampered with by the public.

The rotation of the hand wheel forces plunger into or out of a chamber completely filled with liquid. As the plunger enters, the pressure in the chamber is increased and acts upon a brass-faced rubber diaphragm which forms its bottom. A spindle or stalk on this diaphragm is in contact with the valve, which is held up by a spring. When the plunger is moved down, the valve is opened, and *vice versa*. By this means the driver controls the pressure admitted to the engine according to the requirements of the track and the gradients.

A good many pipes are naturally required to effect the distribution of the air.

The high pressure cylinder is 5¼ inches in diameter, and the low pressure cylinder 8 inches in diameter, the stroke of both being 8 inches. They drive on to a crank shaft, which is geared to the driving axle by compound spurwheels of special construction. These wheels have been designed to run without noise and vibration, and they fulfill their object very completely, since it is impossible to hear them even when sitting immediately over them. Each wheel is formed of four steel plates, which were originally clamped together, and had the teeth formed on them in a wheel-cutting machine. The plates were then placed separately in a lathe, and a good deal of the superfluous metal was removed to lighten them, and at the same time the teeth were slightly reduced in width. The plates were then bolted together so as to make a stepped wheel, brown paper being inserted between the surfaces in contact, and the hollow spaces between the plates being filled with hard wood to deaden the sound. To keep the wheel always accurately in pitch in spite of the play of the springs of the car, a novel arrangement of axle box has been introduced. The box is curved, and plays in guides curved to a radius struck from the center of the crank shaft. Thus, however much the car body may rise or fall, the pitch circles of the two wheels always remain in contact.

Elaborate means are provided to control the speed of the car. In addition to the regulator and the reversing lever on each platform, there is a foot brake, and an air brake, which can be applied either by hand or by the automatic action of a centrifugal governor. This governor is driven by a band from the axle, and operates a valve by which air is admitted from the reserve to the brake cylinder. The action of putting on the air brake also automatically cuts off the supply of motive fluid to the engine by admitting the pressure to act upon a piston which operates a valve in the main air pipe. The governor does not open its valve until the speed of the car exceeds ten miles an hour, when it immediately puts on the brake and shuts off the air. As soon as the speed falls the brake comes off, and the engine starts again without attention on the part of the driver. There is also a speed indicator driven by a band.

The frame of the car is strengthened by a truss which rises to the level of the under side of the seat. For moving it in the shed there is provided a hand turning gear consisting of teeth cast on the inside of one of the driving wheels, and engaging with a three-toothed pinion turned by a handle.—*Engineering.*

Jeddah and Mecca.

Many parts of the East are rendered more unhealthy from the want of sanitary arrangements than from heat, locality, and situation. If the authorities in these parts are awakened to the necessity of cleansing the roads and streets, and providing drainage and water, there would be opened to engineers and contractors a large field in carrying out the necessary works. The following example, though a bad case, is probably not an extreme one:

The once important town of Jeddah, on the Red Sea, now chiefly known as the landing place of the pilgrims constantly visiting Mecca—46,000 last year—and at which there was a serious outbreak of cholera in 1864, has at length obtained a water supply, but in other respects its sanitary state is not improved. Jeddah is about forty-five miles from Mecca, has a resident population of about 30,000, continuously augmented by pilgrims, the bulk of whom belong to the poorer classes, the prevailing temperature is a damp heat of 90°, and beyond the immediate suburbs the country, as far as the foot of the hills—ten miles—is a desert. Until recently the scanty supply of water for the inhabitants of the town was derived from a few cisterns and wells in the desert outside. For years attempts were made to have water brought into the town from the adjacent hills, where there existed a plentiful supply in a natural reservoir at a distance to be traversed in four hours. For a long time these attempts failed, owing to the opposition of the proprietors of the cisterns and wells, as they derived a considerable income from the sale of the water, which was sold in ordinary seasons at 1d. per pail or 1·14d. per gallon, and in seasons of drought at much more. With the exception of two slight showers, no rain fell between December, 1886, and January, 1888. Fortunately, the waterworks begun some years previously had been completed, the scheme having at length been carried to a successful issue, and public fountains are erected in various parts of the town for the gratuitous supply of water to the inhabitants. The quality of the water is excellent, and it is hoped that some improvement may be looked for on the general unhealthiness of the town; but before this can take place much more will have to be done. There is no system of drainage. A large cesspool is constructed in the foundations of all houses when being built. This cesspool when full is emptied by the simple method of digging a big hole before the door and transferring the contents thereto. The repetition of this practice has converted Jeddah into a mighty cesspool, which, added to the absence of sanitary precautions generally, excessive heat, and scarcity of water, sufficiently accounts for the great mortality from fever, causing it to be the most unhealthy town on the Red Sea.

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Preventing Noise on Railway Bridges.

According to *La Semaine des Constructeurs*, the government administration of the new metropolitan railroad in Berlin has devoted considerable attention to the subject of diminishing the noise of trains passing over the viaducts and bridges, which, of course, form the principal portion of the road. Wherever possible, the viaducts are built of brick or stone, and the sound of light trains running over these is not very annoying; but arches of masonry cannot well be used in crossing crowded streets, and the metallic structures employed in such places rattle and reverberate in a manner which not only upsets the nerves of pedestrians, but by startling horses passing beneath is frequently the cause of accidents. In experimenting to find means for overcoming the trouble, it is found that the form of the bridge does not perceptibly affect the noise from it, a lattice truss, notwithstanding the multiplicity of joints, producing no more sound than a plate girder; but the length is a very important factor, so much so that the noise is considered by the German engineers to be directly proportioned to the span of the bridge. Where the rails rest on wooden cross ties, or on timbers running longitudinally, the sound is less than where they are secured directly to the metal, and it may be still further diminished by placing cushions of felt or rubber under the timbers before bolting them to the bridge construction.

To cover an iron bridge entirely with planking does not appreciably diminish the noise from it unless the planking is covered with gravel, a thin layer of which has a marked deadening effect, while still more improvement is obtained by thickening the layer of gravel about the track so as to bury the cross ties or longitudinal timbers on which the rails rest. Profiting by these suggestions, the Berlin engineers have adopted two different systems for diminishing the noise of trains on their viaducts. One is to bolt to the bridge structure long troughs of sheet iron, about 16 in. wide, so arranged that a rail will come in the center of each. The troughs are then filled with gravel, in the middle of which is buried the longitudinal timber carrying the rail, and the space between the troughs is covered with iron plates on which is spread a thin layer of gravel. The second method, which is found to be more efficient than the other, consists in placing a continuous series of shallow iron troughs, about 5 ft. square, along the line of the tracks. These are filled with gravel, on which the ties and rails are laid.

[In New York it is noticed that a heavy fall of snow renders the elevated railways almost noiseless.]

Horse, Steam, or Electricity.

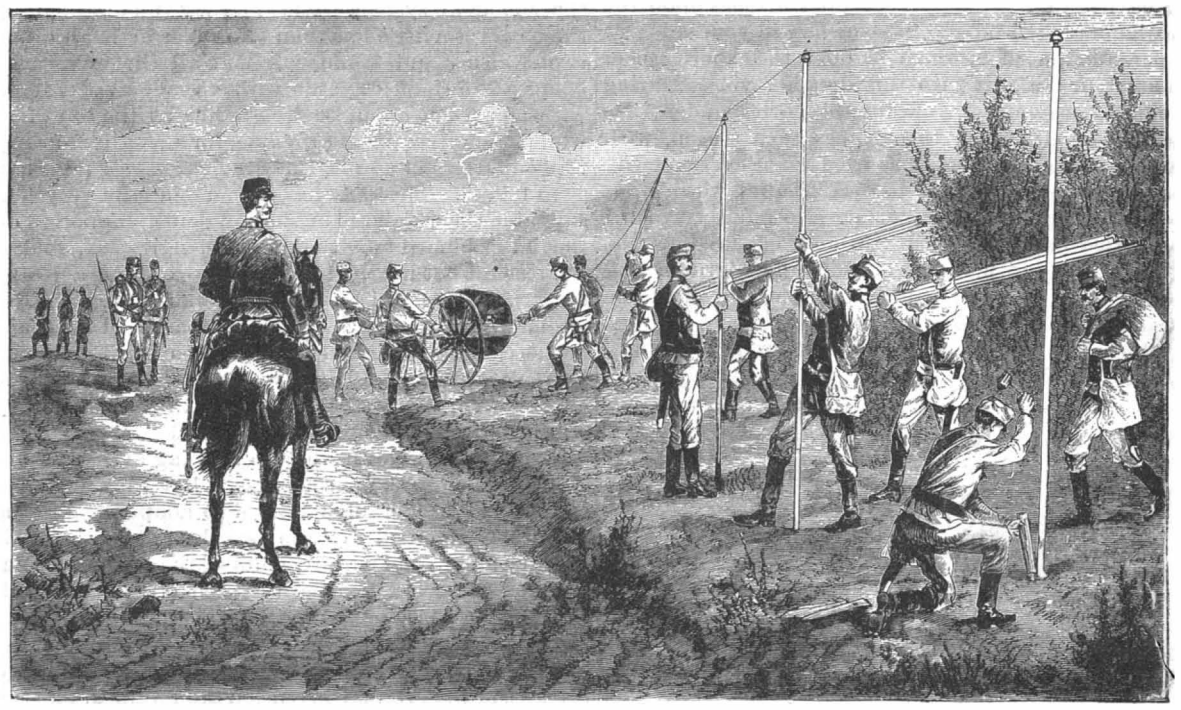
Mr. Ransom, writing on the comparative cost of steam, horse, cable, or electricity, takes a sample road, six miles long, with twenty-four cars, a speed of six miles an hour, and running twenty hours out of twenty-four. This would require forty-eight horses on the lines and 192 in the stables, costing, with harness, initially about $38,400. The initial cost for electrical plant he estimates at $26,500, for cable plant $35,000, and for comparison these figures may be put:

A motor plant of horses costs $38,400; of electricity, $26,500; of cable apparatus, $35,000. With regard to the road, the estimate is for horse road single track per mile, $9,000; electric varies, according to system, from $10,000 to $23,500; cable roads from $30,000 to $110,000; steam, $9,000. If old roads have to be adapted to the new traction, the cost of adaptation is given for a six mile road: For cable, $265,200; for electricity, $70,500; for steam, $40,000. In conclusion, Mr. Ransom says: "In original cost, expense of operating, cost of maintenance, outlay in applying to old roads, steam distances every other mechanical system."

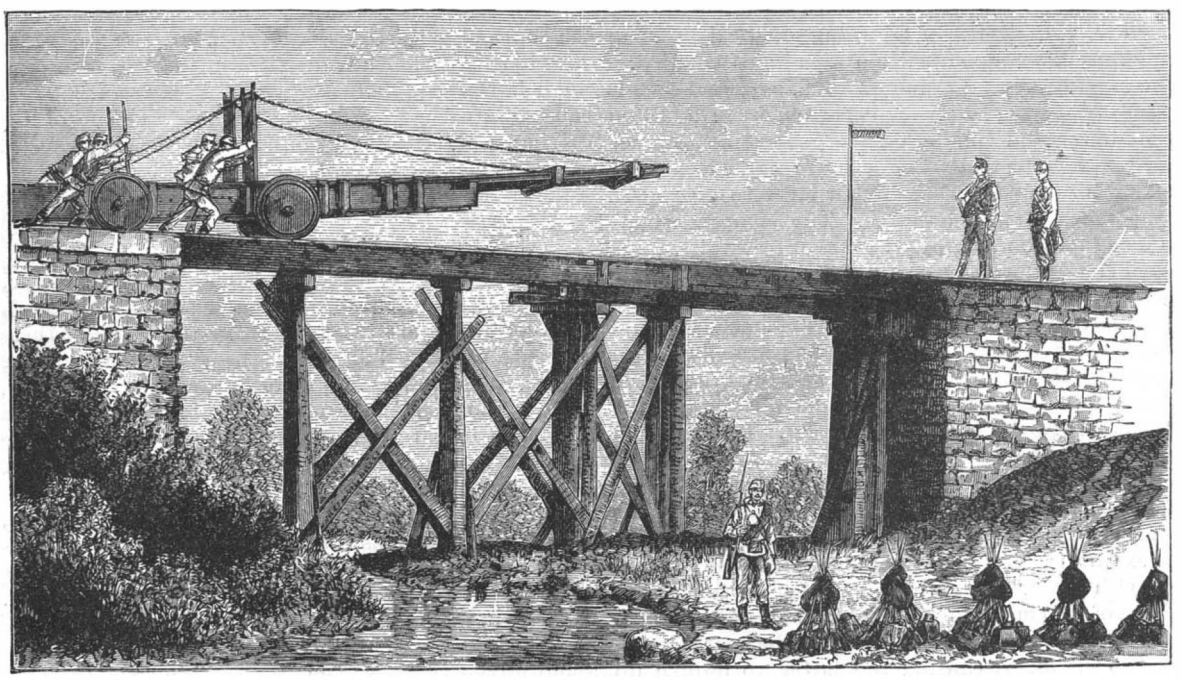
MODERN MILITARY APPLIANCES.

In modern warfare those preparations which facilitate the rapid transportation of the army, the communication of the several sections with one another, and the prompt and satisfactory supply of provisions to the troops, play as important a part as the arming, equipment, and leadership of the army. For years past the Austrian war department has made a point of improving and perfecting the existing military arrangements, and has lately made many innovations in this direction.

It is very important for the welfare of the troops that they should always be provided with fresh meat and bread. The former is obtained by driving cattle after the army, and the latter by the use of transportable field bakeries. The separable field ovens of the "Payer system," which are used in the Austro-Hungarian army, proved, during the last great maneuvers,



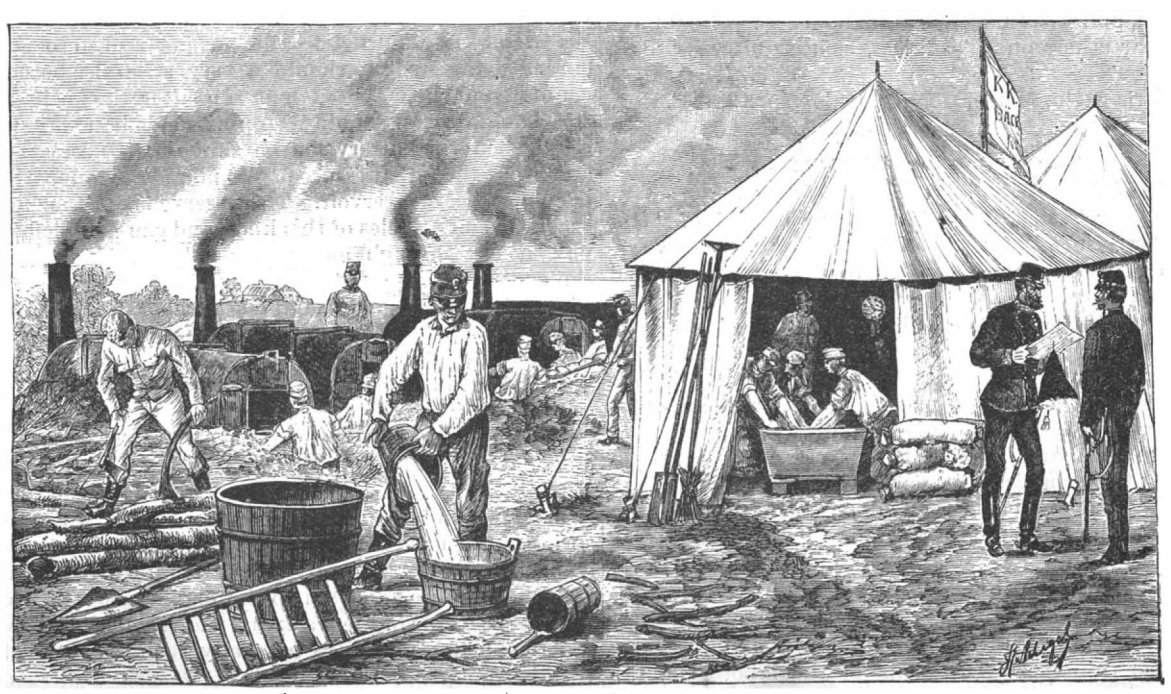
ERECTION OF THE TELEGRAPH BY THE RAILROAD AND TELEGRAPH REGIMENT.



THE RESTORATION OF A PORTION OF A ROAD BY THE RAILROAD AND TELEGRAPH REGIMENT.

to be excellent. The ovens are taken apart, and they, with the other utensils belonging to the field bakeries, are placed on special wagons and carried with the troops so as to be ready in case of need. A field bakery generally consists of three sections of forty-eight ovens, each section being divided into four parts, and each of these parts containing four ovens, which latter are always set up and operated in pairs. It requires four hours to set up the ovens and tents. A field bakery of this kind can deliver 17,928 loaves of bread for nine "heats," each loaf forming two rations.

With the very extensive fronts of the large armies of the present day, it is not always possible to communicate by telegraph, specially when two divisions are separated by marshy ground. In such cases the field signaling apparatus can be used to advantage. This is an optical telegraph which consists essentially of a triangular and a hexagonal piece of linen, which can be so arranged in different positions in relation to each other that full dispatches can be transmitted very quickly. As, however, an apparatus of this sort cannot be employed in foggy weather, numerous electric telegraphs must take its place. The construction of the latter (particularly the laying of the cables) is attended to by the railroad and telegraph regiment which has been formed in Austro-Hungary during the past few years. This is a corps similar to the pioneer corps, and is, like the latter, armed with the pioneer sword and also with the extra corps gun; and the uniform is of the same gray with steel-green trimmings, bearing the winged wheel as a special mark. All of the officers of the telegraph regiment, as well as those of the pioneer regiment, are mounted. In placing the telegraph wires they are allowed to run off a drum which is mounted on two-wheeled cart, and then secured to the light, transportable telegraph poles which are supplied with insulators. Furthermore, the construction of short connecting railroads for the transportation of troops, ammunition, and provisions forms a part of the



FIELD BAKERY.

MODERN MILITARY APPLIANCES.

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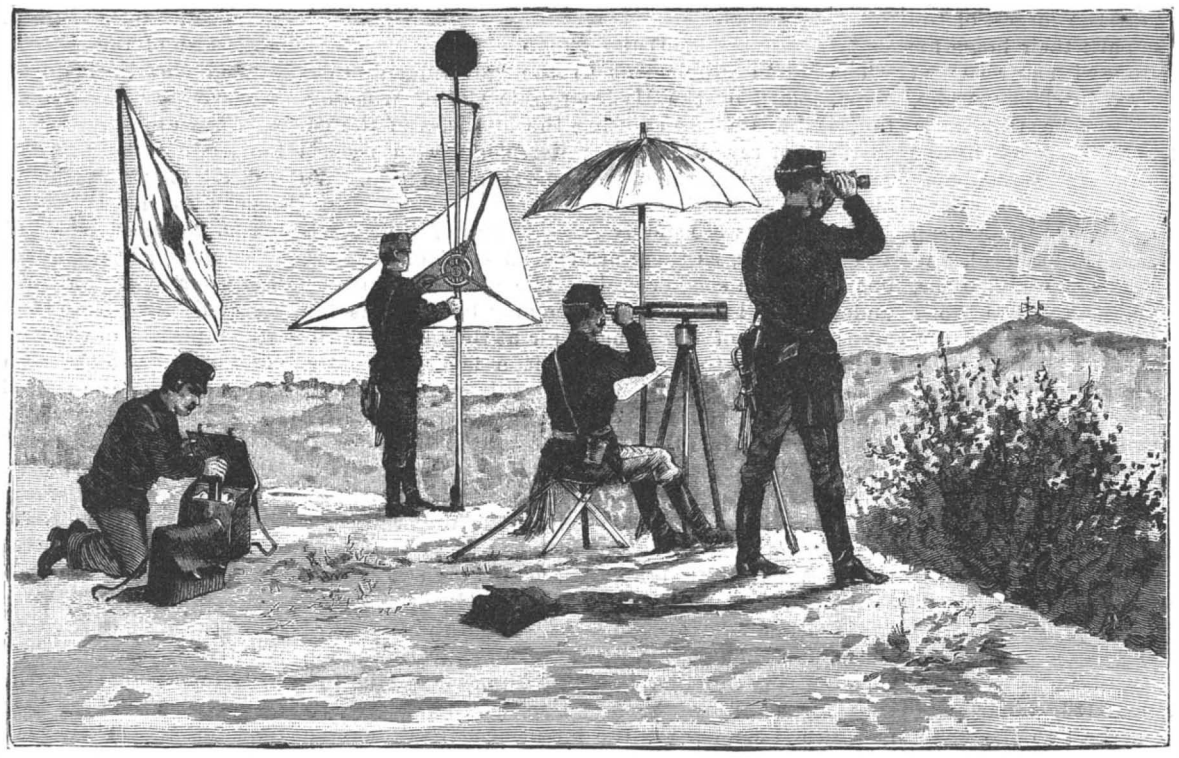
duty of the railroad and telegraph regiment, while another important duty consists in replacing parts of roads destroyed by the enemy. This regiment, like the pioneer corps, has a special train for carrying the building material, the necessary tools, blasting materials, etc.—*Illustrirte Zeitung.*

Sugar from Coal Tar.

The wonderful coal tar sugar story, which has been published in nearly every newspaper within a year, is again revived, and from a recent article in the *German Sugar Manufacturers' Journal* it appears that a factory for the production of that wonderful product known as saccharine is now completed, and will be fully equipped for work in a few weeks. It is located in Westerhausen, near the old historic city of Magdeburg. This coal tar sugar, having a sweetening power 300 times greater than cane sugar, it is said, will be used for mixing with glucose, and it is presumed will, in a large measure, displace the product of the cane for the same purpose. The journal from which we gather the above facts also states that one pound of the new saccharine mixed with 500 parts of glucose gives a compound as good as the best sugar used on the Continent, while it can be supplied at a much lower price.



MODERN MILITARY APPLIANCES—FIELD SIGNAL STATION.

A SIMPLE AND POWERFUL STUMP PULLER.

A stump pulling machine in which the power is applied on the screw principle, through a worm wheel working horizontally, in connection with a chain wheel, and by which the most difficult jobs can be readily and economically performed, has been patented in the United States and Canada by Mr. John Cornelius, and is represented in the accompanying illustration. The framing of the machine is preferably of iron, to give greater strength and durability, and in the frame are journaled horizontal and vertical shafts, the latter having an upward extension to receive the sweep to which the team is hitched. The vertical shaft is stepped in a socket block, with washers, to save wear, and is provided with a worm which meshes with a worm wheel on the horizontal shaft. This vertical shaft is so constructed that it can be thrown in and out of gear—thrown in when operating, and thrown out to draw the chain out its full length for the next pull, to avoid the moving of the lever.

There is rigidly fixed on the horizontal shaft, in connection with the worm wheel, a chain wheel, on which the chain is wound in operating or unwound by throwing vertical shaft out of gear. The chain wheel is formed with a radial circumferential groove adapted to receive the size of chain to be used, there being three different sizes made of the machines, which vary only in the use of a lighter or heavier screw wheel, and in the different chain wheel required for the stronger or lighter chains best adapted for various classes of work. Guides, in the form of tubes or throats, are fitted for the passage of the chain through them to and from the chain wheel, the machine being adapted to pull with either direction of movement. The machine may be anchored to the ground or to a central stump, and under strain will assume position with the receiving guide in the direction of the greatest strain, the machine conforming to the variations in strain. A principal point claimed for this machine over others is that, while the latter are carried or drawn from one stump to another, this machine, being anchored to a central stump, can be made to clear from one to two acres of ground without moving it, the machine adjusting itself, as each stump is loosened, toward the next strongest stump, and so on as the operation proceeds, until all the stumps are extracted. The services of two men and one boy are all that are required to work the machine successfully, and when in operation from one to five or more stumps at a time can be seen yielding to its great power. It is also well adapted for the pulling of standing timber of the post oak variety and for moving buildings and other heavy bodies.

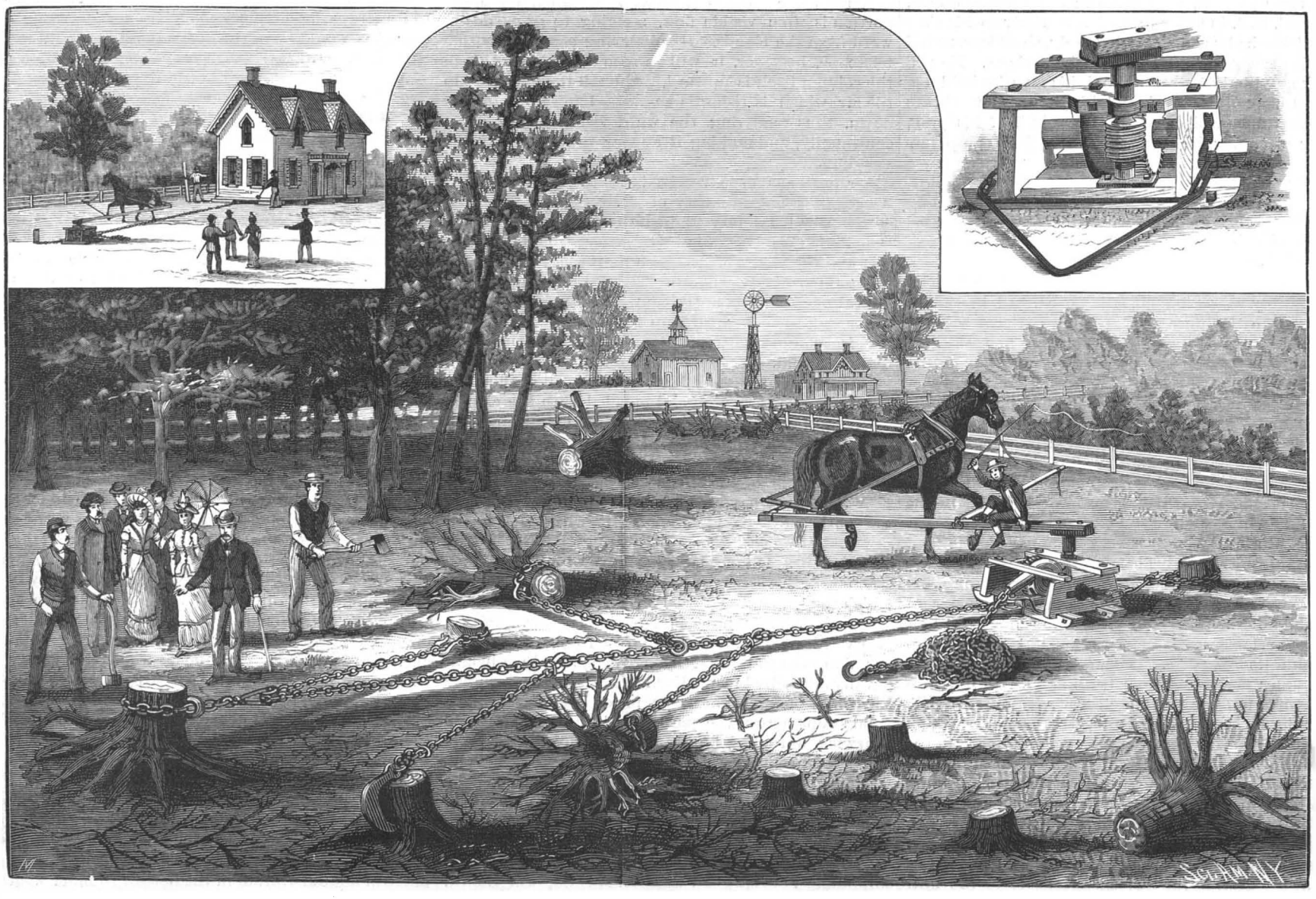
For further particulars with reference to this invention, or machines made under it, address Mr. John Cornelius, Buffalo, N. Y., where the machine is now on exhibition.

Sick Headache.

Dr. S. F. Landrey says in *Popular Science News* that the headache of indigestion, accompanied by scotoma, or scintillations and dazzlings of light before the eyes, is always due to acidity and evolution of gases in the stomach. When not accompanied by aphasia or by a want of co-ordination, it is easily cured by common saleratus or supercarbonate of soda. Let the patient take one-fourth of a teaspoonful in much water—say, four to six tablespoonfuls, or more—wait a few minutes, and if not relieved repeat the dose. The glimmering soon ceases, and the pain forgets to follow. Hot water can be used if the stomach is very weak, and Bondault's pepsin will sometimes relieve it without the soda.

Human Bite.

Physicians agree that the poison conveyed by human teeth is one of the most annoying that they have to deal with. One of them writes to the *Medical Register:* "I have under my attention severe and most complicated cases of blood poisoning, in which the patient had but slightly abraded the hand in the course of a fight by striking the knuckles against the teeth of his opponent. I have known hands thus poisoned only saved from amputation by the application of all the resources of science."



THE JOHN CORNELIUS GRUB AND STUMP PULLER.

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Natural History Notes.

A principal attraction up at the Central Park is the monster elephant recently purchased, and now in the big stable back of the "Lion House." Though evidently very young, he is quite as large as "Samson," who will be remembered as by far the largest of the great herd that have made the park their home for many a day, but now gone to Europe with a circus, and Superintendent Conklin, well versed in elephant lore, says if he keeps on growing he will soon be much larger than "Jumbo" was, and consequently surpass in height any captive elephant of these times. He has an oblong head, concave forehead, and small ears, which proves him to be of the order *Elephas indicus;* the African variety having a rounded head, convex forehead, and enormous ears. With increasing tissue and bone, though now nearly nine feet high, his appetite grows apace; he having an eager tooth for carrots and turnips, and consuming daily about 2½ trusses of hay, 200 pounds of vegetables, washing it down with about 80 gallons of water. Curiously enough, the natural enemies of the elephant—the tiger and the rhinoceros—are both near by, in the adjoining "Lion House," and, when the doors are open, almost in clear view of their prey.

Another curiosity is the infantile agouti, *Dasyprocta isthmica*, the *Chloromys* of Cuvier, born a fortnight since, and the only specimen ever bred in North America. It looks like a rabbit when it sits up on its haunches, the mother having the general appearance of a great rat, whence its common name in the language of Central America, mountain rat. It has sharp and well developed claws, which would lead to the belief that it is both a burrower and a climber, yet it is neither. Like the rabbit, its hind legs are longer than the fore. It sits erect while eating, holding its food between its forepaws, and though now having nothing to fear, barred safely in its cage in the park, it cannot overcome the habit of caution it inherits, of stopping continually while feeding, looking furtively around, and then, as if to make assurance doubly sure, testing the air in its immediate vicinity with its acute nose to discover if enemies unseen are lurking about. The agouti is allied to the rabbit and cavy, and its flesh is highly prized as food among the Indians of Central America.

The newly arrived tayra (*Mustelidæ*) is about eighteen inches long, with a thick coat of jet black fur, changing to golden yellow about the throat, and sparkling, restless eyes. He is from South America, and evidently unused to confinement, being continually in motion, in a vain attempt to discover a loophole of escape to the delightful country now surrounding him in the park; an eagerness by no means lessened by the vernal odors that now and then are wafted through the open window just before him. Of the weasel order and cousin to the badger, the ermine, and the ferret, and the like, he is loose jointed, serpentine in movements, crafty, and cruel, and, in order to conform strictly to his class—*Mustela*—he has an elongated body, short legs, round ears, five toes on each foot, and sharp claws. He will attack any kind of small animal, his favorite hold being just back of the head, and his jaws and teeth are so powerful he will often crush the skull of his prey, killing whenever he can, apparently from pure maliciousness. In his native country he is regarded as a pest, for, because of his slender body and loose joints, he manages to get at poultry, let them be cooped up ever so tightly, and will carry his thirst for blood among fowls even to the point of extermination, if not detected and driven off in time.

The recently arrived Philippine Islands deer is a shy beast, rarely venturing out of his straw bed in the little house in the deer park, though perhaps it is the climate he dreads rather than the nurses and children that, all through the day, peer into the wired inclosure, for coming from the Eastern archipelago, on the border of the China Sea, it is very warm, being, indeed, in the tropics, and he would doubtless prefer more rain and not quite so much snow, as it never snows where he was raised, though raining for quite half of the year. He resembles not a little what is generally called the hog deer, a specimen of which is also to be found in the park, and will be pointed out to you by the keeper if you ask him. His body is very large, considering his height and the size of his legs. The coat is brown and fawn colored, with here and there a trace of white.

The spotted cavy, *Coelocenys cavy*, also a recent arrival, is of the order *Rodentia*, like the agouti, but, unlike the latter, does not sit upon its haunches and eat out of its fore paws. It bears a strong resemblance to a Guinea pig, comes from Brazil, and, like our own prairie dog, undermines large areas with burrows just under the surface of the ground, where he lives.

The recent blizzard proved too much, for many of the pea fowl and Guinea fowl, which are left to run free in the park all winter, were frozen. The two big white polar bears in the large inclosure under the hill northwest of the Arsenal were the only animals in the park who really appreciated the blizzard; and when a gang of men, muffled to the tops of their heads, went out to dig out the deer, in the inclosure opposite to the bear pit, who were like to be snowed up tight in their house, they discovered the polar bears sitting in the most exposed part of their den, with the gale rushing through and appearing to be thoroughly happy, as if this was the first time they had been cool enough since they left the frozen North.

Waterspouts.

The March supplement to the government pilot chart, issued by the Hydrographic Office, Washington, contains a map showing the localities of the occurrence of several recent waterspouts, with reports concerning some, and other general information. We abstract the following:

Waterspouts are simply special cases of whirlwinds and tornadoes, as these are special cases of cyclones, but on a much smaller scale. The general principles underlying all these phenomena may be stated as follows: A layer of warm, moist air at the surface of the ocean happens to have above it a layer of cooler, drier air. This condition of things is one of unstable equilibrium, and sooner or later the warm, light air at the surface rises through the cooler and heavier air above. This process sometimes takes place gradually over large areas, but at other times it is more local, and there seems to be formed in the upper layer a break or opening through which the air of the lower layer begins to drain upward, as through a funnel. Under favorable conditions—that is, when the differences of temperature and moisture and the supply of warm, moist air at the surface are great—this action becomes very intense, and this intensity is still further increased by the fact that as the air rises its moisture is condensed, the latent heat thus liberated adding to the energy of the rising column of air. Now, as this surface air rushes in and escapes upward through the opening thus formed in the upper layer, it takes up a rotary or whirling motion, the velocity of which increases toward the center or axis of the funnel, and a suction or partial vacuum is created, as indicated by the low reading of the barometer at the center of a cyclone or whirlwind. In the case of a great cyclone or hurricane, the direction of rotation is determined by the revolution of the earth about its axis, and the well known law of storms is founded on the fact that this rotation is, in the northern hemisphere, invariably against and in the southern with the hands of a watch as you look at a watch laid down with the face up. In the case of tornadoes and waterspouts, this direction of rotation is not so uniform, although the same law holds good in most cases.

When a whirlwind is thus formed over the ocean, water is often drawn up the center of the whirl some distance, owing to the suction created, and at the same time the moisture in the air is condensed as it rises, so that the name "waterspout" is very applicable. Indeed, sometimes a spout will burst over a vessel and flood her decks with water, as a cloud burst does a mountain side. When a spout is forming, its upper portion is often visible first, seeming to grow downward from the clouds. By observing carefully with a telescope, however, it will be seen that the motion in the column itself is upward, although the moisture in the air which is rising is condensed lower and lower down, thus rendering the whirl visible lower down continually, and making it appear to be actually descending.

A report has been received from Captain Dexter, American steamship City of Para, who saw several large spouts, January 22, in latitude 31° 47′ N., longitude 74° 33′ W. The wind was strong from the northeast and the sky overcast, with light scud, but the sea was comparatively smooth. Three huge spouts were seen at once, and six in the course of half an hour. The water seemed to be drawn up from the sea, mounting in spiral columns of tremendous thickness, with a loud, roaring sound. Some of the columns were vertical, some inclined at a considerable angle, all of them increased in size at the top and blended with the clouds. A fine rain or mist filled the air, and continued for some time. The wind soon after changed to east.

Captain Cleary, British steamship River Avon, states that on the 28th, in latitude 39° 30′ N., longitude 57° 20′ W., he saw what he took to be a heavy squall to the southeast. Upon looking at it with his glass he saw that it was a whirlwind, raising the water to a great height. It must have been over a mile in diameter, but he hesitates to even estimate the height to which the water was raised or the size of the spout, although it must have had terrific power. Shortly afterward a smaller one passed close to the ship, whirling along the water and raising the spray to a height of fully a hundred feet. Even as far south as Bermuda the conditions were the same, for on the 27th a whirlwind swept across the parishes of Southampton and Warwick, unroofing houses, blowing down trees, and damaging property generally.

Similarly, two cyclonic storms, which seem to have originated about the Bermudas on the 10th and 12th of February, as indicated in the weather review published on the March pilot chart, were attended by water spouts, at least one of which was disastrous to shipping. February 10, at 9 A. M., Captain Smith, British steamship Ethelbald, in latitude 28° 18′ N., longitude 74° 06′ W., reports a large spout traveling in a northeasterly direction, rotating, apparently, with the hands of a watch. The barometer was rising, fresh, variable winds, mostly southerly, sky overcast, with very heavy rain. At this time the American bark Reindeer, Captain Strandt, was about 200 miles to the westward of the Ethelbald, running up the coast toward New York, in the Gulf Stream. On the 11th, the weather became squally, with light southerly winds, and at 10:30 A. M., in latitude 33° 04′ N., longitude 76° 06′ W., when the vessel was under full sail, a heavy waterspout passed over her, completely dismasting her below the heads of the three lower masts. No previous warning was received, the weather was apparently clear at the time, and the whole affair was over in a few minutes. The dismasted vessel reached Bermuda on the 16th.

That portion of the North Atlantic from the northern coast of Cuba to the 40th parallel, and from the Atlantic coast of the United States to the Bermudas, is pre-eminently a region where waterspouts are liable to occur, owing largely to the warm, moist air which hangs over the Gulf Stream and the cool, dry air brought over it by the northwesterly winds from off the coast. A glance at the pilot chart, which shows the general course of the Gulf Stream and the positions where waterspouts have been reported, indicates this fact very clearly. This great warm ocean current is now beginning to reassert itself after a period of comparative quiescence during the winter months, and with increasing strength and volume is approaching its northern limits as the sun moves north in declination.

The warm, moist air overhanging this great "river in the ocean," and the cool, dry air brought down from the coast and from over the cold inshore current to the northwest, are thus the elements whose intermingling generates these dangerous whirlwinds on the ocean.

Everett Hayden, of the division of marine meteorology, says: The attention of masters of vessels is again called to the desirability of making full and accurate reports of these, as of other marine phenomena, by means of which our knowledge can be still further increased. The most important observations regarding a waterspout are the temperature of the air and water, the reading of the barometer, direction and force of the wind, and the changes which take place in each while the spout lasts. Also, the direction of rotation of the whirl, and an estimate of its size, character, and changes of form, with, if possible, sketches, however rough, of its appearance at the various stages of its formation and progress. Many naval vessels are now provided with photographic apparatus, and portable cameras are in such common use by travelers that it may not be too much to expect that advantage will be taken of some favorable opportunity to secure instantaneous photographs from the deck of a vessel to illustrate these remarkable phenomena. Such photographs would be of the greatest value and interest to this office. J. R. BARTLETT, Commander, U. S. N.
Hydrographer to the Bureau of Navigation.

Lipanine as a Substitute for Cod Liver Oil.

Cod liver oil is in certain cases so wonderful a medicine, that we must regret that we do not know its active constituents with exactness, so as to be able to administer them in a form less repugnant than that of the oil itself. M. Mering has performed an experiment in this line that should be noted.

Starting from the theory, adopted by most doctors and pharmacologists, that cod liver oil owes its superiority over other fatty oils to its richness in oleic acid—white oil contains from 0·18 per cent to 0·71 per cent, and brown oil 2·54 per cent to 5·07 per cent—the author has tried experiments with a mixture of olive oil (100 parts) and oleic acid (6 parts), to which he has given the name of lipanine, and to which he attributes the following advantages:

Lipanine would have no disagreeable taste and would be perfectly digestible, because of its high emulsive power, oleic acid saponifying with the alkalies of the bile and pancreatic juice. For this reason it could be administered for long periods in large doses without injury to the digestive faculties. In fact, M. Mering reports that for a period of six months he administered this remedy to forty patients, of whom thirty were children, and that all took it without repugnance and without subsequent ill effects. The dose varied from one to four teaspoonfuls, according to the patient's age, and this was continued from six weeks to three months. Most of the patients were scrofulous or rickety, some consumptives or diabetics. All of them under this treatment increased in weight, their general condition improved, their strength returned, and these good results were obtained also among a great number of children in charge of Professor Kohts. In a word, these effects would appear absolutely comparable with those obtained with cod liver oil, but the advantages of lipanine in its freedom from taste, easy toleration by the stomach, and capability of administration in the hottest summer weather are equally obvious.—*Revue Scientifique.*

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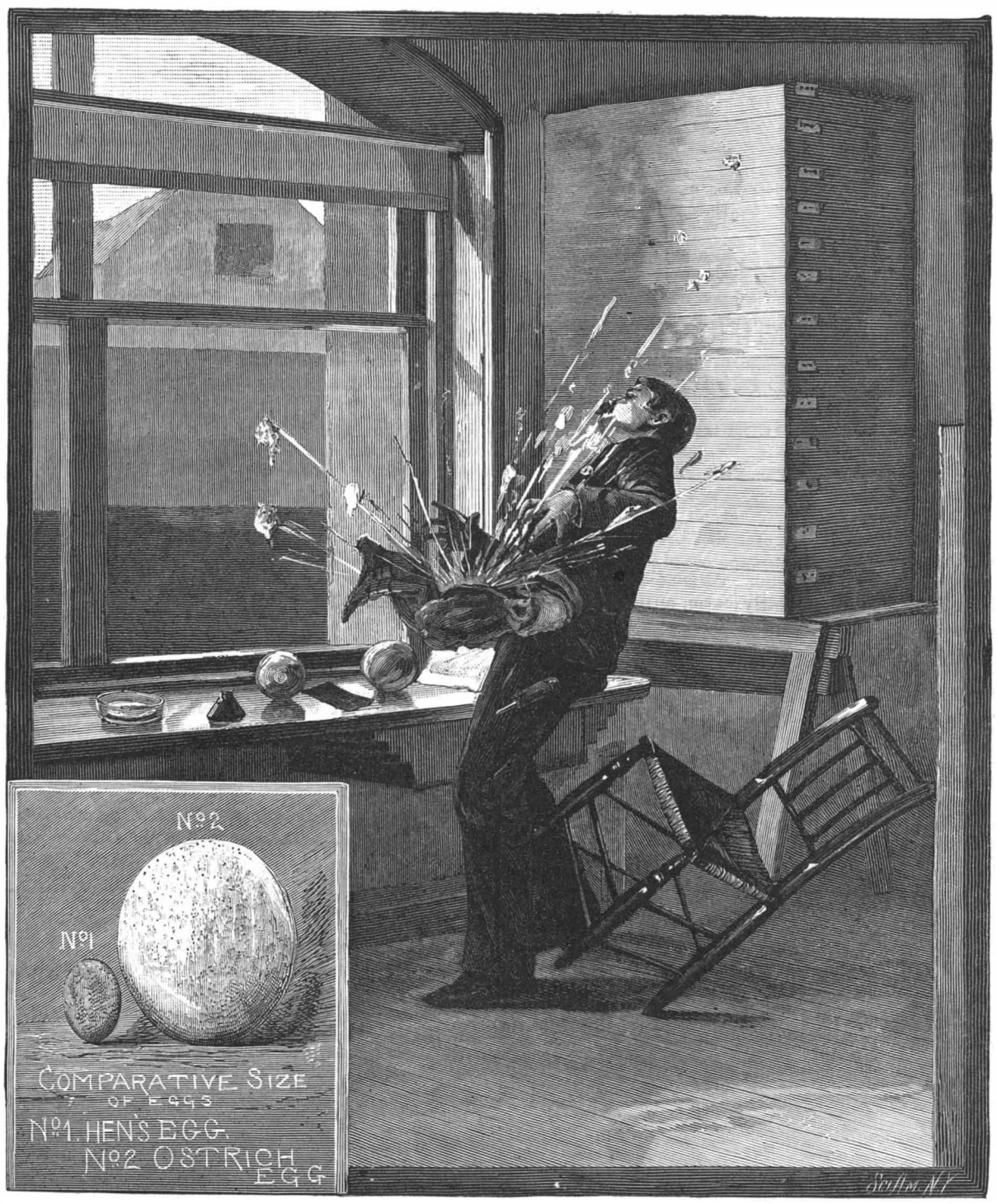
EXPLOSION OF AN OSTRICH EGG.

Our sketch shows a scene in the basement of the Peabody Museum, New Haven, Conn., at the time of the explosion of an ostrich egg in the hands of Dr. George Baur, who was experimenting with it. An odor was produced in the building worse then condensed sulphureted hydrogen and rotten eggs combined. When Dr. Baur came to New Haven to assist Prof. Marsh in the Peabody Museum, he wrote to Dr. Atherstone, in South Africa, for some ostrich eggs. They were shipped on November 14, 1885, in the bark Aurelia. She was wrecked near Trinidad, but the eggs were saved, and reached New Haven several months ago.

On the day of their arrival Dr. Baur found four of them in the box, and began at once to get the embryos out of the shells, for they were what he wanted to observe. He had filed two little holes in two of the shells, and had blown out their contents successfully.

He wrapped a towel around the third, and began to file a hole in its shell. A hiss and an explosion followed, which knocked over and astonished Dr. Baur, and when he recovered he found himself cut and covered with the contents of the shell. None of the stuff had hit him in the eyes, but his face was considerably cut up.

Dr. Baur says that the first two eggs had been punctured and treated with sulphate of mercury, which prevents fermentation, while the third had not, and its long voyage had stirred up a lot of powerful gas inside its 18½ inch circumference shell, which burst as soon as the file had weakened it enough. The shell is an eighth of an inch thick, and so tough that it cannot readily be broken. As far as can be learned, it is the only accident of the kind on record.



EXPLOSION OF AN OSTRICH EGG.

Plows and Plowing.

Professor J. W. Sanborn, of the Missouri State Agricultural College, has issued a bulletin giving the results of experiments made by him, in which he shows that as plowing is usually done there is a great loss of power, resulting in either inferior work or overtaxing th team, from the improper adjustment of plows with reference to depth and width of cut, improper adjustment of harness, the use of colter of any form, and the non-use of wheel or truck under the end of beam to regulate the depth of furrow. The tests of draught were all made with the dynamometer, previously tested for its correctness, and its indications carefully noted, so that the results arrived at can be accepted as correct.

Most farm harnesses have an extension of the hip straps with a loop at the end, through which the traces pass to hold the latter in place when the team is unhitched. This loop is about on a direct line of the trace when the horses are hitched to a farm wagon; but when taken from e wagon and hitched to the plow, the doubletree are so much lower than when on th wagon as to caus an angle in the trace from where it passes through the supporting loop to the whiffletree. Such conditions he found caused a rious rease the draught. The least draught is found where the trace extends in a direct line from its attachment at the hame to the center of draught in the plow when adjusted to its best depth for working.

The use of a colter of any kind also added to the draught, while the use of a wheel under the end of th beam—now fallen into disuse—lessened materially the draught. Thus, as a result of several tests, with and without the truck or wheel, the following averages were reached: Average draught per square inch of furrow turned with wheel on, 4·87 pounds; without wheel, 5·56 pounds; per cent of draught saved by use of wheel, 14·1. In the test of colters, the old and new style knife and rolling colters were used, with the following results: Average draught with colter on, per square inch of furrow turned, 5·77 pounds; with colter off, 4·99 pounds; loss by use of colter in per cent, 15·6, or about the same as the gain by the use of the wheel.

Explorations at Sepharvaim.

Mr. W. St. Chad Boscawen the other day delivered at the British Museum a lecture on the subject of the recent identification by Mr. Hormuzd Rassam of the ancient city of Sepharvaim. Mr. Boscawen began his lecture by saying that considerable interest had been aroused in the subject of Babylonian explorations by the statement that an American expedition was about to undertake explorations on the site. According to traditions recorded by Berossus, the city of Sippara had existed before the flood, and it was in the record chambers of its ancient temple that the books recording the history of the beginning and progress of civilization until the coming of the Great Cataclysm were placed by Xisathrus, the Chaldean Noah. Explorations on th site, although not indicating so remote an antiquity as antediluvian times, nevertheless clearly assigned to the temple of the Sun God, which formed the center of the city, an antiquity far exceeding any hitherto ascribed to events in Chaldean history.

Th lecturer then described the discovery of this site y Mr. Hormuzd Rassam, in 1880, in the ruins at Aboo Hubba, about nine miles from the banks of the Euphrates and about forty-five miles fr m Babylon. The explorations in tl temple resulted in the recovery of several inscriptions which clearly proved the existence of the temple and city as early as the 39th century before the Christian era. Mr. Boscawen carefully described the evidence on which the antiquity of the famous Babylonian Sargon's inscription was based. The historical statements on the cylinder of Nabonidus were in all other particulars accurate. The presumption was, therefore, strongly in favor of the authenticity of this remote date of 3,200 years prior to the restoration, in B. C. 550. On palæographical grounds, also, the remote antiquity of the inscription was certainly to be admitted.

Mr. Boscawen then proceeded to describe some other inscriptions found on this site, among which were some cylinders recording the restoration of the great canal known as the Nahr Malka by Khammurabi, a monarch who reigned about B. C. 2200. These inscriptions, coupled with others written nearly fifteen centuries later by Nabupalassar, the founder of the new Babylonian empire, showed that during the long time which had elapsed the Euphrates had shifted its course to the westward. In the remote period of the primeval Sargon (B. C. 3800) the river no doubt flowed close to the walls of Sippara, but in B. C. 2200 it had removed so far west that a canal had to be cut to connect the city with the river, and in B. C. 550 this canal had to be still further prolonged to meet the still receding river. These facts afforded geological evidence of the antiquity of the city. Mr. Boscawen then proceeded to describe the temple which Mr. Rassam had discovered, and pointed out the close resemblance which it presented to the Jewish temple. Its internal arrangements, and even the names of the different portions, were identical with those of the Jewish temple. The Holy place (*hekal*) was separated from the Holy of Holies (*parrako*) by a veil.

The lecturer next passed to a study of the civil portions of the temple, and remarked how close a parallel these presented to those of the Mohammedan mosque. The temple was the treasury. It was also the school, and, like the mosque, was supported by glebe or *wakuf* estates and by a regular tithe. As an interesting example of the tithes levied in Babylonia, Mr. Boscawen quoted a very important tablet recording the payment of the tithes by the *major domo* of Belshazzar, and also a list of dues paid by the prince himself on behalf of himself and his father.

The lecturer then described the remarkable discovery made by Mr. Rassam of the treasury of the temple, in which several thousand tablets were stored. These tablets were of the greatest importance, covering a period reaching from the fall of Nineveh, in B. C. 625, until the time of Alexander the Great. These archives threw the greatest light upon all branches of Babylonian social customs, and enabled us to restore the life of the people in the bygone past with the fullest detail. Mr. Boscawen, in concluding his account of the work, said that great as had been the light thrown upon the history of the city, of which a few years ago we knew so little, it was very meager compared with what might be done when the still buried portions of Sepharvaim shall have been thoroughly explored, and he trusted that the work would now be undertaken and thoroughly and systematically carried out.—*London Times.*

The Canada Fishery Question.

Fish, like insects, swarm around a light, and this fact may have an importance which the *Evening Journal* (Ottawa) thinks may have a bearing upon the fishery dispute between Canada and the United States. The United States steamship Albatross has been fitted up with electric lamps for fishing purposes. These lamps are incased in wire netting. The fish, attracted by the lights, swarm into the nets and are easily caught without other bait. If the electric light, as is now claimed, will answer all th purposes of bait, the Americans will have no occasion to buy of Canadians, and Canadian fishermen will lose one of the natural advantages that they now have over Americans.

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ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. Antoine Muller, of Terre Haute, Ind. It has a link adjuster by means of which the link may be held at different angles to enter higher or lower drawheads, and an elevating shaft extending to the sides of the car by which the coupling pin may be lifted.

A cut-off valve has been patented by Messrs. Roland Bentley, of Dresden, and Thomas Ford, of Longton, Stafford County, England. It consists of an equilibrium hollow cylindrical slide valve worked by an eccentric from the main shaft, with cylindrical valves inclosed therein and worked by an eccentric and governors, or otherwise, as an automatic variable cut-off or expansion valve for steam, air, and water engines.

MISCELLANEOUS INVENTIONS.

A bed pan has been patented by Kate M. Duffey, of Astoria, Oregon. The invention covers certain details of construction whereby such a device may be used with as much convenience as possible, and can be readily and thoroughly cleansed.

A trace supporter has been patented by Mr. Alfred Anderson, of Stromsburg, Neb. It is attached to the back pad skirt, and is adjustable thereon to hold the trace high or low, according to the size of the horse or the work to be done, the supporter having no direct connection to the back pad.

A perforator for printing presses has been patented by Messrs. Robert and George Kennedy, of New Westminster, British Columbia, Canada. It has an oscillating bar carrying a series of perforating teeth, and adapted to be supported in the form, in combination with devices for oscillating the bar.

A whiffletree hook has been patented by Mr. Jay C. Davis, of Marshfield, Wis. It consists of a loop having a slot dividing and leading into it, the slot being formed in a line diagonal to the direction of length of the loop, with a supporting plate adapted for connection with the whiffletree or bar.

A nail brush has been patented by Mr. George H. Coursen, of Baltimore, Md. The rear end of the handle of the brush is provided with a central nail-cleaning projection and guards on opposite sides to protect the nail cleaner from injury, the design giving a very efficient shape to the nail cleaner.

A floating oil distributer for vessels has been patented by Mr. John Ericson, of Sabine Pass, La. It consists of a boat of suitable size to be readily carried upon and secured against the weather side of a vessel in case of storm, to automatically, by the action of the waves, distribute oil upon the waters to calm them.

A barbed fence has been patented by Mr. Orlando Huffman, of Friend, Neb. The cables are formed of two strands, one above another, the barbs projecting in one direction only, downward from the cables, with other novel features, the fence being designed not to injure stock while affording an efficient obstacle to their passage.

A folding chair has been patented by Mr. Hiram F. Henry, of Gowanda, N. Y. It is designed to be light, strong, and inexpensive, folding perfectly flat, and so that a series can be arranged to form a folding settee, the invention covering various novel features, and being an improvement on a former patented invention of the same inventor.

A candlestick has been patented by Messrs. Robert H. Mehl and Robert Knott, of Brooklyn, N. Y. It is designed more particularly for lighting and ornamenting Christmas trees, etc., and consists of a wire bent to form a supporting arm, and near its upper end a loop with a reflector, and a pin wheel pivoted on an extension.

A miter box has been patented by Mr. Charles Lyman, of Clarinda, Iowa. It consists of two hinged boxes having their approaching ends beveled, and their upper faces with a longitudinal groove, with other novel features, being especially adapted for tinners' use in jointing eaves troughs or gutters at an angle.

A vest protector has been patented by Mr. Benjamin Ives, of Chicago, Ill. It consists of an apron having a perforated binding along its upper edge, in combination with S-shaped hooks received in the holes of the binding and adapted to engage the edges of the vest pockets, making a simple and efficient device for protecting garments.

An addition register for pencils has been patented by Mr. Henry C. Rose, of Leadville, Col. This invention relates to that class of addition registers which are mounted upon the end of a pencil, and provided with register wheels and an index hand to indicate the aggregate of several successive additions.

A trunk has been patented by Mr. William J. Large, of Brooklyn, N. Y. To the tray are pivoted the arms of a bent bail-shaped rod, the body in one piece and the two arms at right angles to the body, and adapted to be held in suitable bearings at the back of the trunk, so that in raising and lowering the tray both ends will move together.

A perfumery stand has been patented by Mr. James C. Austin, of Brooklyn, N. Y. It is adapted more especially for holding bottled perfumery for exhibiting it to customers, and is designed to prevent theft, while affording full view of it in an attractive manner, the invention covering various novel features in the construction of the stand.

A reach coupling for vehicles has been patented by Mr. Stephen M. Wier, of New Haven, Conn. Combined with the axle and reach are conical bearings secured to the axle, and conical sockets attached to the reach for receiving the bearings of the axle, thereby providing large adjustable wearing surfaces in which the king bolt is not subjected to wear.

A gate has been patented by Mr. John W. Rutledge, of Shannondale, Ind. It is so constructed that whether a person approach the gate from one side or the other, by drawing on the operating cord the gate will be opened away from him, and by drawing on the operating cord on the opposite side the gate will be closed and latched.

A mouth piece for pipes has been patented by Mr. Henry C. Rose, of Leadville, Col. It has an attachment formed as a tubular stem with a bulbous end, having an annular opening around the bulb, which allows the smoke to spread and issue in a diffused sheet at right angles to the stem, modifying the effect of the hot current of smoke.

A washing machine has been patented by Mr. Horatio J. Lockhart, of Fostoria, Ohio. This invention relates to washing machines in which the material to be washed is drawn between revolving rollers, one or more of them having a longitudinal reciprocating movement, and covers various novel features in a simple, durable, and easy running machine.

A brick truck has been patented by Mr. James C. Steele, of Statesville, N. C. The invention covers a novel construction and combination of parts in a hand truck especially adapted for transporting short brick hacks, either in the hack or on pallets, without rehandling or rehacking them, the truck being strong, light, and easily handled.

An apparatus for making drills has been patented by Mr. John H. Kane, of Huntington, West Va. It has a pair of grooved rolls, a roll-advancing mechanism, a gauge arranged in connection with the rolls, and a gauge-operating mechanism, being designed to make straight and spiral ground drills cheaply, and of uniform and standard size.

An apparatus for transferring pig iron from its bed has been patented by Mr. William H. Fredericks, of Johnstown, Pa. It consists of a combination of lifting jacks, an elevated track frame mounted upon movable sections of the jacks, and bearing rails upon which wheeled trucks run, with other novel features, for transferring pig iron to the breaker for reducing it to proper lengths.

SCIENTIFIC AMERICAN

BUILDING EDITION.

APRIL NUMBER.—(No. 30.)

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The Knowles Steam Pump Works, 113 Federal St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

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The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Curtis Pressure Regulator and Steam Trap. See p. 77.

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Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 28.

"The Improved Greene Engine." Flat slide valves, both steam and exhaust. Providence, R. I., Steam Engine Co., *sole* builders.

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NEW BOOKS AND PUBLICATIONS.

DEFENSE OF THE SEA COAST OF THE UNITED STATES. By Bvt. Brig.-Gen. Henry L. Abbot, U. S. Army. New York: D. Van Nostrand. 1888. Pp. 167.

In this book are contained a series of five lectures delivered by the eminent author before the U. S. Naval War College, in November, 1887. The subject is treated from all aspects, and a very clear idea of the present status of coast defense is presented. Many figures of artillery practice and results add to the value of the treatise. The author's personal views are of course strongly brought out. Thus, his devotion to submarine mines, and his opposition to the pneumatic dynamite gun, which he intimates should be called a mortar, are equally clear. He claims that the last named weapon would be of great injury when used by the defense, as it would interfere with the success of fixed mines, by countermining or exploding them, thus destroying its own defenses. But by the use of ordinary care in its manipulation, it would seem secure from this danger. It is also perfectly clear that the enemy might use the pneumatic gun with great success, as a countermining, so that its uses in war are rather emphasized by this very objection.

L'ELECTRICITÉ: NOTIONS ET APPLICATIONS USUELLES. Par Aug. Michant. Paris: George Carré. 1888. Pp. viii, 410.

This book covers the whole science of electricity and all its applications. Much is necessarily treated in an abridged style, but the whole subject is very well presented. Upward of 300 illustrations, among which we recognize some reproductions from the columns of the SCIENTIFIC AMERICAN, add materially to the interest of the work, as they are generally well chosen and pertinent to the subject.

EASY EXPERIMENTS FOR SCHOOLS AND FAMILIES WITH HOME-MADE APPARATUS. By A. R. Horne, A.M., D.D. Chicago: A. Flanagan. 1886. Pp. 79. Price 35 cents.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) C. V. A. writes: 1. Iny our SCIENTIFIC AMERICAN of April 23, 1887, you describe the winding of the armature for an 8 light dynamo machine. Can two layers of wire be substituted for the four layers therein prescribed, making one layer of wire per section instead of two? Of course I would not expect such good results, but would find it much easier to construct it in this manner. A. You can make coils of one layer each, but the number of coils must remain the same. Better follow the instructions and use two layers in each coil. 2. Can ordinary paint be used for coating the top edges of a Leclanche battery cell to prevent the salts of sal ammoniac from forming? A. Paint is not of much value for this purpose. Better use paraffine, tallow, or wax.

(2) W. O. D. asks: 1. How long will bichromate plunge batteries last in constant use? A. Three or four hours. 2. Are they expensive to keep in order (recharging, etc.)? A. As compared with steam or gas for motive power, yes. 3. Would the same pattern serve to use on bells and other experimental purposes? A. It is not adapted to ringing bells, but is excellent for a great variety of experimental work. A. Would a motor on smaller scale work as well, using less battery and of course developing less power? A. Yes.

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(3) H. R. Y. asks: 1. Is the dynamo electric machine described in SUPPLEMENT, No. 600, suitable for electroplating? If not, what change should be made? A. The dynamo referred to is not suitable for electroplating, but, by winding the armature with No. 12 wire, one layer in each coil, and the field magnet with No. 9, it may be made to answer the purpose. 2. Will cast iron do for the field magnet and armature core of the simple electric motor, described in No. 11, current volume of the SCIENTIFIC AMERICAN? A. Cast iron will do for the field magnet, but the armature core should be made of iron wire.

(4) E. C. asks (1) if a piece of wrought iron of the required dimensions would not answer for the armature core instead of one made of wire. A. Wrought iron will answer, but not as well as iron wire. 2. And if a field magnet made of wrought iron would not answer for the one made of strips of Russia iron? A. Yes. 3. Also if a battery, used for an electric bell, would develop sufficient power to run the motor itself, without using it to run anything else? The battery I have is a pile Leclanche. A. No.

(5) Old Subscriber.—SCIENTIFIC AMERICAN SUPPLEMENT, No. 384, contains directions for transferring and coloring photographs on glass.

(6) J. A. M. asks: 1. How can I find the required height of water in any steam boiler? A. In horizontal tubular boilers, the water line should be at one-third the distance from the top of the tubes to the top of the shell. In locomotive stationary boilers, the water line should be one-third the distance from the top of the crown sheet to the top of the shell. In vertical boilers of ordinary make three-fourths of the tubes should be in contact with solid water. 2. How to make flanges on boiler and dome heads. A. Put flanges on boilers with a putty made of white lead, iron borings, and Prince's metallic paint, equal parts, made up with boiled linseed oil. 3. How can I make a vertical steam boiler any size, at small cost? A. We cannot teach an easy way of boiler making. Make boiler in the regular way with good material and workmanship. 4. In making vertical boilers with the tubes extending up above the water, is there not danger of the flues leaking? A. We do not approve of the use of vertical boilers, where a horizontal one can be made available. The exposure of the upper end of the tubes and tube sheet to undue heat is not desirable, and gives much trouble in that class of boilers, especially when made short, as for steam yachts and launches.

(7) F. W. P. asks: Is there any chemical which, added to melted glue, will keep it in a liquid state when cold? A. An excellent liquid glue is made by taking a wide mouthed bottle, and dissolving in it 8 ounces best glue in ½ pint water by setting in a vessel of water and heating until dissolved. Then add slowly 2½ ounces strong nitric acid of 36° Baume, stirring all the while. Effervescence takes place with generation of fumes. When all the acid has been added, the liquid is allowed to cool. Keep it well corked and it will be ready for use at any moment.

(8) J. G. F. desires a good receipt for making root beer. A. Take 1 ounce each of sassafras, allspice, yellow dock and wintergreen, ½ ounce each wild cherry bark and coriander, ¼ ounce hops, and 3 quarts molasses. Pour sufficient boiling water on the ingredients, and let them stand 24 hours, filter the liquid and add ½ pint yeast, and it is ready for use in 24 hours.

(9) C. J. W. asks: Can cast iron be soldered so as not to leak water, and how? A. Solder cannot be made to flow on cast iron. Pure tin may be wiped over a crack by cleaning the surface and using tinner's acid, with a soldering iron.

(10) R. R. J. asks: Could an 8 light dynamo be run by windmill to charge a storage battery for lighting, and what power would be required to run it? A. Yes; eight 16 candle power incandescent lights will require about 1½ horse power with an economical dynamo. A windmill of 2 horse power should be able to charge a storage battery for an evening dur ng the 24 hours and accumulate a surplus.

(11) H. F. B. asks: Who was the patentee of the monkey wrench, and is the name spelled Monkey or Moncky? A. "Monkey" is the proper spelling. The name is largely used for mechanical and nautical appliances. The wrench is very old, and we do not know that it was originally patented.

(12) S. E. H. writes: I wish to make some hollow lead castings, about 4 pounds in weight, shell ⅛ inch in thickness. The crooked shape of casting prevents digging the core from the center and clearing it from obstructions, although there is a hole or opening at each end. Can I cast them in iron mould (in halves), using a suitable shape core, and use a liquid that will soften the core, so that it can be washed out? A. Make the core with flour paste, as little as possible to hold the sand. Make it in halves, so that you can excavate a passage clear through the center when the halves are pasted together. Scratch out all the sand possible from the casting and make a connection with a waterfaucet or pump and wash out the central parts. If the sand does not all wash out, pour in sulphuric acid 1 part, water 2 parts, mixed. It will soon loosen the sand so that it will wash.

(13) M. B. asks (1) a good cement to fill in the cracks of a floor before painting or staining it. A. You had better use strips of wood driven in and planed off smooth and even with the floor. Cement will break up and look rough in a short time. 2. What preparation is used for lamp wicks to obviate the necessity of trimming them? A. Use asbestos wicking for incombustible lamp wick.

(14) F. G. B.—The common varieties of prepared mucilage are made by treating dextrine with sulphuric acid, which in time destroys the color of the stamp. Better use a mucilage made by dissolving gum arabic in water.

(15) J. C. B. asks the best way to cover steam pipes laid in very damp, moist soil. Cold spring water around them condenses the steam as fast as it flows in. A. You cannot protect the pipes when water has free access to the covering. Make a drain beneath the pipe, then box the pipe with an air space of 2 inches all around the pipe. Pipe can lay in chocks in the box to keep it in place. Cover the ends of the box to prevent circulation of air.

(16) J. S. G. asks how to straighten out pieces of zinc (which are cut for shoe patterns) so as to make perfectly flat. The number of zinc is 14. A. This work requires as much care as to flatten a saw blade. Gently hammer on a flat iron upon the parts that draw up or bulge, not on the bulge itself. A little practice is necessary.

(17) V. L. C. asks: 1. How to make a strong cement to mend china. A. See the article on "Cements" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158. 2. How to make a preparation that will clean marble figures that are greasy and very dirty. A. Make a paste with fuller's earth and hot water, cover the spots therewith, let it dry on, and the next day scour it off with soft or yellow soap.

(18) M. asks for a recipe for a yellow dye or stain, to stain sap pine or cypress. A. Either brush over the work with a tincture of turmeric or warm the work, and brush it over with weak nitric acid, varnish or oil as usual, a very small bit of aloes put into the varnish will give a rich yellow color to the wood.

(19) A. H. T. asks a receipt for a strong percussion cap, one that explodes easily. A. Use 100 grains of fulminating mercury triturated with a wooden muller on marble, with 30 grains of water and 60 grains of gunpowder. A solution of gum mastic in turpentine is used as a medium to attach the mixture to the metal.

(20) J. L. P. asks how to make common glue dissolved mix with linseed oil and remain so. A. We know of no means by which this can be accomplished. An alkali such as soda or potash would probably make them mix, but its effect would be to spoil the inherent qualities of the linseed oil.

(21) C. J. S.—You will find full directions for pressing plants and forming a herbarium in SCIENTIFIC AMERICAN SUPPLEMENT, No. 501.

(22) J. E. C. asks: What articles combined will produce spontaneous combustion in the shortest time? A. Water and potassium.

(23) T. B.—Ampere's theory states that currents of electricity travel around a magnet in planes at right angle to its axis, as if a fine wire were wrapped around it. No theory of any note holds that longitudinal currents exist in them. It is all theory and little more than a framework to organize facts. If the observer looks toward the north pole of a magnet, the current is assumed to move in the direction opposite to the hands of a watch.

(24) S. W. writes: I wish to use a low fusing solder of lead, tin, bismuth, and cadmium, and find difficulty in making a strong joint. What should I use as a flux to obtain a clean solid joint, and not raise the melting point of the alloy, which is 150° Fah.? A. Use Venice turpentine or Canada balsam.

(25) J. S. asks: What kind of woods are the best to resist the action of steam, with the least amount of warping? A. Yellow pine and oak.

(26) G. W. H. asks: What kind of oil should be used in oiling base ball bats after they are turned out, and how should the oil be rubbed in? A. Use boiled linseed oil on a rag.

(27) C. E. H. asks the best way of cleaning a bronze chandelier, soiled with fly specks, etc. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 39, process for refinishing by dip and lacquer.

(28) E. C. H. asks: 1. Will you kindly answer through your paper, whether the body of field magnet, or armature core of electric motor described in your paper of March 17, 1888, could be made of soft cast iron without injury to the working or the power of motor? A. Yes. It has been described and illustrated in our columns. 2. Is there any way or process to melt or dissolve small pieces of carbon, such as thrown out of electric street lamps, so as to make it into sheets of ¼ inch and upward in thickness? A. No. You may grind them to powder, and mix into a paste with sugar and water, and after moulding may heat them in a covered receptacle to full redness. This will give an inferior product, unless a retreatment with the sirup, followed by a second baking, is given.

(29) J. P. F. asks: 1. Can you inform me how long the battery recommended will run the "Simple Electric Motor," described on page 165, of the March 17, 1888, number, before becoming exhausted? A. Three or four hours. 2. Can the battery described on page 390 of the December 17, 1887, number be used to run this motor? A. The battery is too small for the purpose.

(30) W. E. asks: 1. Could I not double the dimensions of the one described? A. Yes. 2. Would I need a larger size of magnet wire? A. The magnet wire may remain the same, and you can adapt its resistance to your battery by connecting the coils 2 inches parallel. 3. How many cells of bichromate battery would be required? A. About 12. 4. What power would it develop? A. Probably ⅛ horse power.

(31) O. M. W. asks: 1. What is the best and cheapest battery to run simple electric motor described in SCIENTIFIC AMERICAN (vol. lviii., No. 2), that will generate current enough to run two sewing machines? A. The plunging bichromate battery is best for the purpose. It will require about 8 cells. We expect soon to describe a battery adapted to the motor. 2. Could motor be run with an open circuit battery. (Leclanche or Bunsen). If so, how many cells of either would be required? A. The Leclanche battery is not adapted for running motors, as it polarizes in a very short time. 18 or 20 cells of Bunsen connected up in parallel will probably run the motor.

(32) W. P. K. asks: Is there anything with which paper may be saturated, so that the blank portions of the paper will be a conductor, while the portions covered by printing will be a non-conductor of electricity? A. Use bronzed paper and write on it with thick India ink. The surface of the paper will then be a conductor, except where protected by the ink.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 3, 1888,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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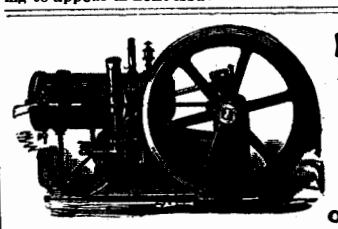

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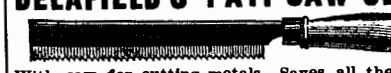

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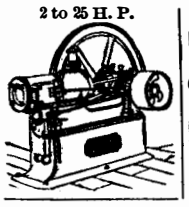

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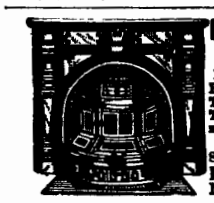

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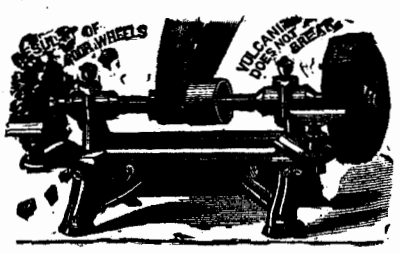

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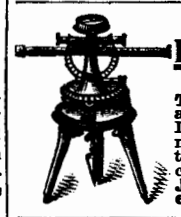

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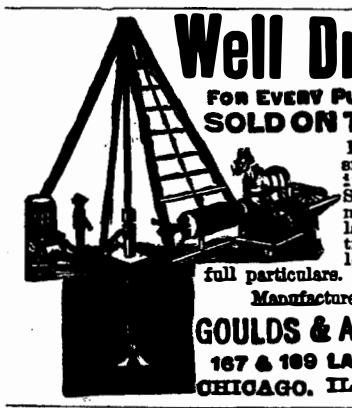

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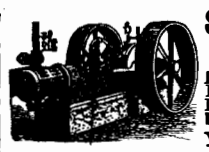

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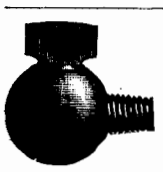

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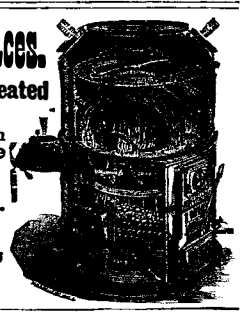

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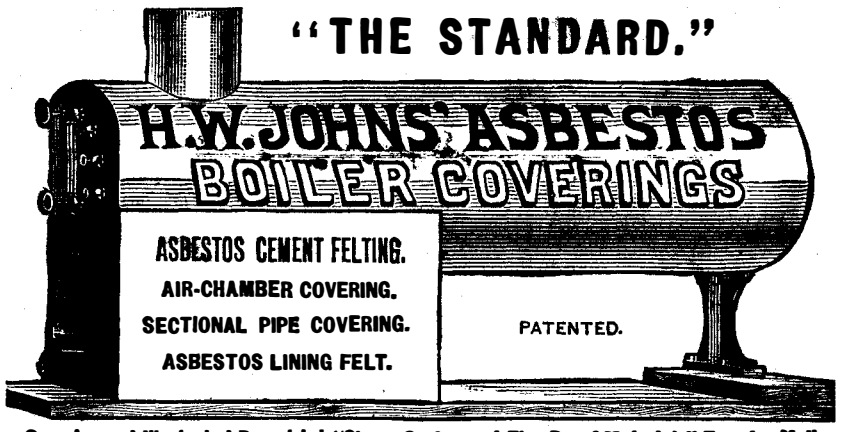

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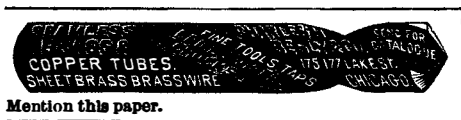

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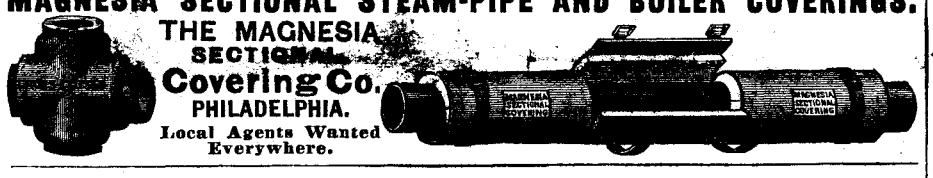

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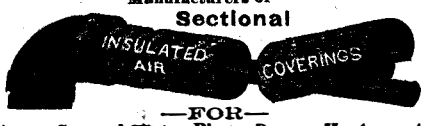

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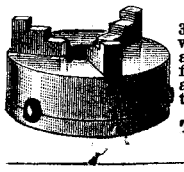

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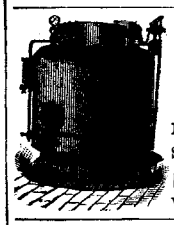

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